

A photograph of a natural area with tall grasses, yellow flowers, and trees in the background. The scene is bright and sunny, with a mix of green foliage and brown tree trunks. In the background, a building and a yellow sign are visible through the trees.

Inventory and Assessment of Indigenous Flora and Fauna in Boroondara

Graeme S. Lorimer, PhD

Inventory and Assessment of Indigenous Flora and Fauna in Boroondara

A Report to
Boroondara City Council

by

Graeme S. Lorimer, PhD

of

Biosphere Pty Ltd

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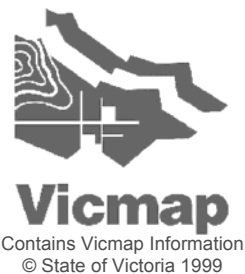
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'Inventory and Assessment of Indigenous Flora and Fauna in Boroondara',
by Graeme S. Lorimer.
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Executive Summary

Purpose

The study, *Inventory and Assessment of Indigenous Flora and Fauna*, was commissioned by the City of Boroondara, in line with a recommendation of Boroondara *Biodiversity Strategy* (Context Pty Ltd, 2003). The study has provided, through this report:

- An inventory of the natural biodiversity assets on public and private land in the municipality of Boroondara, including flora and fauna species, communities and habitat sites, as well as the threats they face;
- A clear indication of ways to manage, protect, enhance and monitor these assets; and
- Advice on plant species appropriate for planting at any given location in the municipality.

This information is provided for each of fifty-eight sites of particular importance, as well as for the municipality as a whole.

Study Approach

The study has three main parts:

- Scientific investigation of the current state of nature in the municipality, including flora, fauna, ecological communities, biologically significant sites, and the threats they face. Pre-existing sources of information were reviewed and used, but most of the investigation involved fieldwork. More fieldwork effort was placed on flora than fauna, for practical reasons and because fauna are heavily dependent on the habitat provided by vegetation. The data from fieldwork and pre-existing sources was analysed by computer;
- Identification of issues that are positively or adversely affecting indigenous flora and fauna in Boroondara, based on the fieldwork observations; and
- Recommendations for improving the positive influences on indigenous flora and fauna, and reducing the adverse effects. There are broad-scale recommendations involving strategic approaches at the municipal scale, and detailed recommendations for the management of individual sites (or even for single trees).

Principal Findings

As anticipated, there was a lot of new information to gain about Boroondara's indigenous flora and fauna.

Flora

The study compiled a database of 6,977 records of plants in Boroondara, of which two-thirds were from the author's fieldwork. These records show where each plant species is found in Boroondara, and how abundant they are at each location.

This database has allowed the compilation of an inventory of Boroondara's indigenous flora (Appendix B) containing 343 distinct species of ferns and flowering plants. Of these, twenty-nine are believed to have become extinct from Boroondara. By comparison, the data include 210 species of introduced plants growing wild in native vegetation in Boroondara.

Although only 8% of the recorded indigenous species of ferns and flowering plants in Boroondara are believed to have become locally extinct, a much larger proportion face extinction in the municipality in the next two decades if corrective action is not taken. **Seventy-nine percent of Boroondara's current indigenous species of fern and flowering plant are threatened with local extinction**, according to internationally accepted criteria. There are also four species listed as threatened with extinction throughout Victoria.

The main threat to indigenous flora is that so many species have precariously small populations, making them vulnerable to inbreeding and poor regenerative capacity when the existing plants die.

Until now, extremely few plant species have been targeted with specific actions to prevent them becoming extinct in Boroondara, and most such efforts have been in Yarra Bend Park. This will have to change if the predicted local extinctions are to be prevented or ameliorated. Some recommendations for establishing a program of protective measures (e.g. a breeding program) are given in Section 4.3. Recommendations concerning particular sites are given in the relevant sections of Chapter 5.

Fauna

A database of 7,809 observations of fauna species has been compiled, of which 1,268 observations were recorded during the fieldwork for this study. The data have led to the inventory of Boroondara's fauna species in Appendix E, including the following numbers of indigenous species believed present today: 153 birds, 14 mammals, 15 reptiles, 8 frogs, 12 fishes and 19 butterflies. There are more introduced fish species than indigenous fish species, but the other fauna groups are represented by more indigenous species than introduced.

Fourteen fauna species are listed as threatened in Victoria, most of which are birds that visit occasionally but do not rely heavily on Boroondara for the habitat. Sixty-six fauna species are threatened with extinction in Boroondara, according to internationally accepted criteria. The main threats are loss of habitat, precariously small populations (as for plants), introduced pests (particularly in the case of fish) and disturbance of waterbird breeding habitat by dogs.

Sites

The biological significance of the fifty-eight sites that were intensively investigated in this study has been assessed using the Department of Sustainability & Environment's standard 'BioSites' criteria. Two sites are of national biological significance: The Yarra River (for threatened fish) and Yarra Bend Park. Eleven sites are of biological significance at the State level due to the presence of endangered Ecological Vegetation Classes, and most of these sites are beside the Yarra River. One other site is of State significance due to three rare trees (the Melbourne form of Yellow Gum, *Eucalyptus leucoxylon* subsp. *connata*). Thirty other sites are biologically significant at lower levels, as judged by the BioSites criteria.

With so many sites of national and state biological significance, **Boroondara makes a substantial contribution to the biodiversity of Victoria**, notwithstanding that many of the sites are small and substantially modified from their pre-European states.

Periodic Review

With so many species being threatened with local extinction, and so many pressures on indigenous flora and fauna within the various habitat sites, the status of the species and sites should be kept under periodic review. It is suggested that this report be updated in approximately five years.

1. Introduction

1.1 Purpose of the Study

The brief for this project specified that it was to provide Council and the community with:

- An inventory of the natural biodiversity assets on public and private land in the municipality of Boroondara, including flora and fauna species, communities and habitat sites, as well as the threats they face;
- A clear indication of ways to manage, protect, enhance and monitor these assets; and
- Advice on plant species appropriate for planting at any given location in the municipality.

Information was requested to be provided on a municipal-wide scale, as well as within each of fifty-eight sites of particular importance. The extent of native vegetation in these individual areas varies from a single old River Red Gum tree with native grass beneath, to large areas of Yarra Bend Park with numerous indigenous plant species.

One purpose of the study was to assist the future monitoring and assessment of biodiversity in Boroondara. The study will also contribute towards Council and community planting programs, the Biodiversity Corridors program, open space planning, and landscape plans for land owned by Council and others.

More specific objectives of the project are described in Action Plan Item 1 of the City of Boroondara Biodiversity Strategy (Context Pty Ltd 2003, p. 24).

An important aspect of the project is to provide the highest possible level of rigour and thoroughness. Previous studies such as the Biodiversity Strategy have documented the flora or fauna of the municipality (or parts thereof), but these studies have been of variable thoroughness, reliability and relevance to the present day. As explained in Chapter 2, the study reported here has included extensive fieldwork and painstaking investigation of previous information sources to obtain a much more reliable assessment of Boroondara's indigenous biological resources.

The project brief specified that Yarra Bend Park (the most biologically significant site in Boroondara) was not within the scope of the expected fieldwork or management proposals, but that relevant information from prior studies could be included for reference. This is because conservation, management and monitoring of Yarra Bend Park are the responsibility of Parks Victoria, who commissioned studies of the park's indigenous flora and fauna in recent years (Beardsell 1997, 2003). Nevertheless, the present author spent one week reviewing and verifying previous information about the park, and conducting a basic site inspection. This was found to be important for placing the rest of the municipality's biological resources in context.

In addition to this written report, the study has produced:

- Large databases of records of flora and fauna species, including the location and date of each record and (wherever possible) the abundance of each species;
- Electronic mapping of sites containing significant flora or fauna (down to the scale of an individual large tree in some cases), to be used in Council's Geographic Information System; and
- A large set of digital photographs of scenes from the sites, mainly for monitoring purposes. All the photographs are available electronically and most are reproduced in the relevant parts of this report.

1.2 How to Use This Report

The fifty-eight sites of biological significance identified in this study are listed, mapped and described in Chapter 5. For readers who simply want to see whether a particular property or area has biological significance, or to read the documentation about a site, it may be adequate to go directly to the key map on page 52, determine the site number, and turn to the corresponding section of Chapter 5. The section about a particular site can also be located using the Contents pages.

To fully appreciate the basis for the assessments that have been made of the sites and the individual species, read Chapters 2 and 3 of this volume, which describe the survey, its methods and main findings.

Readers who want to check on the rarity or other significant features of an indigenous animal or plant species, or the severity of an environmental weed, will find an overview in Sections 3.3 and 3.5, and tabulated inventories in the appendices. The appendices are also useful for translating between scientific and common names. Other technical terms are explained in the Glossary on page 483.

A list of indigenous plant species suitable for planting in different parts of Boroondara is given in Appendix C.

A detailed discussion of issues related to nature conservation in Boroondara is given in Chapter 4, along with recommendations for action.

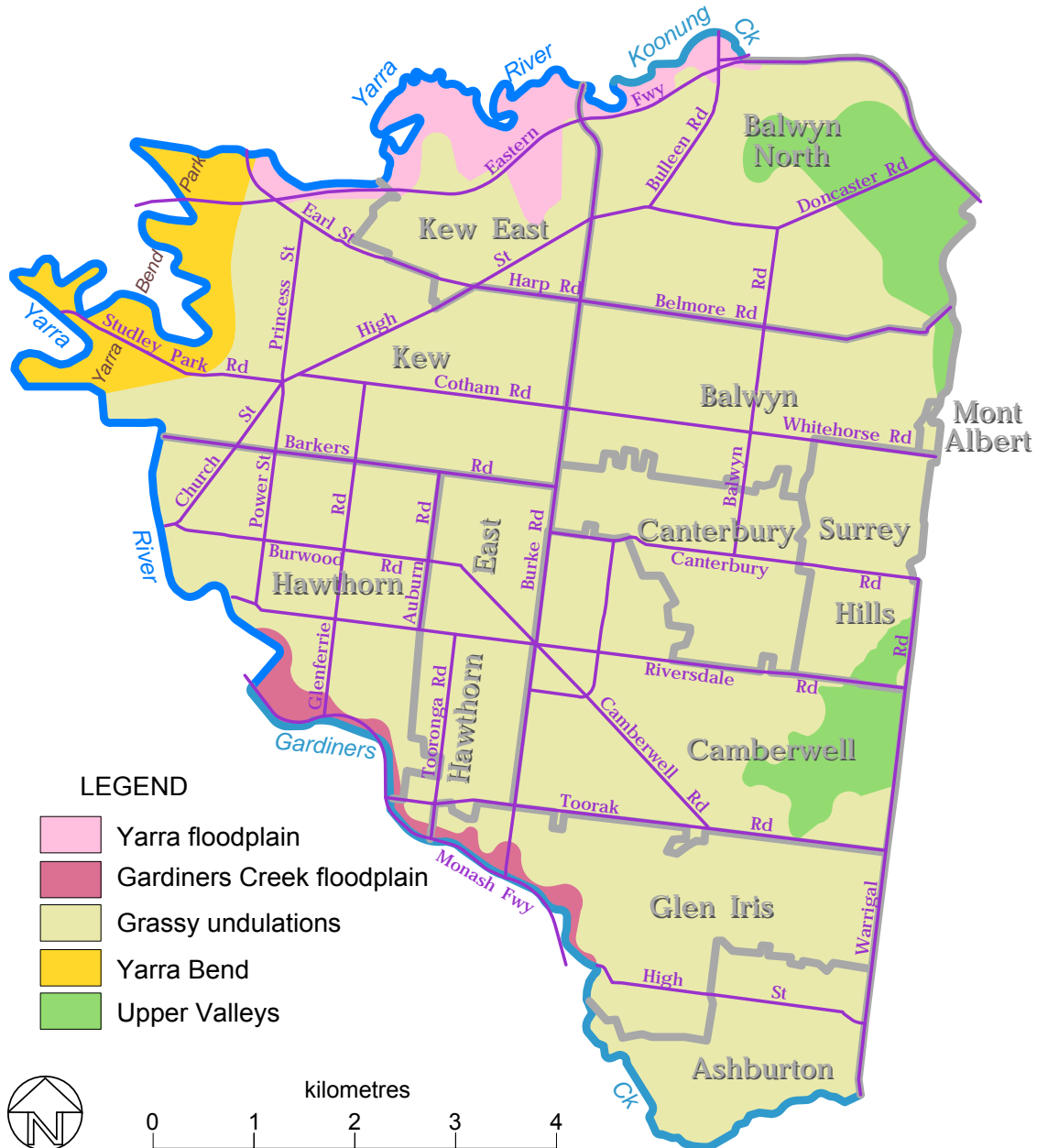


Figure 1. Map of Boroondara's boundaries, suburbs and biogeographical zones (Section 3.1).

1.3 Background about the Municipality of Boroondara

The City of Boroondara is located 5 km east of Melbourne and occupies approximately 60 square kilometres. The suburbs within it are mapped on Figure 1. The municipal boundary mostly follows the Yarra River, Koonung Creek and Gardiners Creek, and the remainder comprises the Eastern Freeway, Warrigal Rd and a north-south link between the two.

The topography is gently undulating except for some steep stream banks (particularly in Yarra Bend Park).

The municipality is mostly residential, and its 160,000 residents make it one of the most populace municipalities in the metropolitan area. There is little industry. The leafy residential areas that dominate the municipality have very scant indigenous flora other than hardy native grasses and occasional large River Red Gums (*Eucalyptus camaldulensis*). Resident wildlife in these areas is restricted to hardy urban species such as magpies, ravens, wattlebirds and possums. However, native butterflies and more sensitive bird species as robins and bronze-cuckoos fly through these areas.

The native biodiversity is quite different in a few habitat oases within these residential areas, as well as along the Yarra River and Gardiners Creek on Boroondara's periphery. These areas retain a higher density of native vegetation (both natural and revegetation) and much richer fauna. The fifty-eight sites described in detail in Chapter 5 include these areas as well as a few sites where the native vegetation is restricted to a very small number of venerable pre-European trees.

1.4 Governmental Context of This Study

Table 1 summarises policies, agreements, strategies etc., from global to local, that relate to this study, and which have been taken into account during the preparation of this report and its recommendations.

Table 1. Summary of governmental policies, strategies etc. related to this study.

Jurisdiction	Strategy, Policy or similar instrument	Relationship to matters in this study
Global	United Nations Convention on Biological Diversity (1993) – ‘The Rio Convention’	<ul style="list-style-type: none"> • Provides a framework for global action to ‘<i>conserve and sustainably use biological diversity for the benefit of present and future generations</i>’ (i.e. make biodiversity serve human values); • Contains guiding concepts, such as the precautionary principle (see Glossary, p. 483) and that each country is responsible for the conservation and sustainable use of its biological resources; • Does not include actions to be taken at the local level.
	Japan and China Migratory Bird Agreements (JAMBA & CAMBA)	Some listed migratory bird species occur seasonally in Boroondara. JAMBA and CAMBA somewhat raise the levels of protection for these species.
National	Intergovernmental Agreement on the Environment (IGAE) of 1992, signed by first ministers of the federal, state and territory governments	<p>Provides a framework for cooperation between levels of government to achieve environmental outcomes. Under the heading, ‘2.4 Responsibilities And Interests Of Local Government’, it states:</p> <p><i>‘2.4.1 Local Government has a responsibility for the development and implementation of locally relevant and applicable environmental policies within its jurisdiction in cooperation with other levels of Government and the local community’.</i></p> <p>The IGAE also establishes general principles such as the Precautionary Principle (see Glossary, p. 483) and consistency of data gathering throughout Australia.</p>

Jurisdiction	Strategy, Policy or similar instrument	Relationship to matters in this study
National (continued)	National Strategy for Ecologically Sustainable Development (1992), signed by first ministers of the federal, state and territory governments.	Provided the impetus and broad context for the National Strategy for the Conservation of Australia's Biodiversity (see below); It also reiterates the Precautionary Principle of the IGAE.
	National Strategy for Biodiversity (1996)	<p>The present study represents local implementation of many of the national-scale objectives of this Strategy. For example, the Strategy states, <i>'There is a need for more knowledge and better understanding of Australia's biological diversity'</i>, and it has the objective (in section 1.5.2) to <i>'Promote the conservation of biological diversity in urban areas by:</i></p> <ul style="list-style-type: none"> <i>'(a) encouraging retention of habitat;</i> <i>'(b) improving strategic planning and infrastructure co-ordination so as to enhance [biodiversity]...;</i> <i>'(d) encouraging action by local governments to retain and improve natural ecosystems...'</i> <p>The Strategy also provided some impetus for <i>Victoria's Biodiversity Strategy</i> and the <i>Victorian Native Vegetation Framework</i> (see below).</p>
	National Framework for the Management and Monitoring of Australia's Native Vegetation (published 2000)	A joint initiative of federal, state and territory governments to coordinate their respective approaches toward a goal of reversing the decline of native vegetation in extent and quality. The <i>Victorian Native Vegetation Framework</i> (see below) was prepared in conformity with this document, and it is an important instrument for conserving Boroondara's native vegetation in accordance with the recommendations of the present report.
	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Provides legal protection against development proposals for certain threatened species and migratory species that are found in Boroondara, as documented in the present report. Also identifies land clearance as a key threatening process. The Precautionary Principle is employed within the Act. There are no requirements on local government, but the Act could help Council to prevent certain environmentally harmful developments.
	<i>National Objectives And Targets For Biodiversity Conservation 2001–2005</i>	<p>Includes the following targets for state and federal jurisdictions, which rely on recommendations of the present report for effective local implementation:</p> <ul style="list-style-type: none"> • <i>'By 2001, all jurisdictions have mechanisms in place, including regulations, at the State and regional levels that prevent decline in the conservation status of native vegetation communities as a result of land clearance';</i> • <i>'By 2001, all jurisdictions have clearing controls in place that will have the effect of reducing the national net rate of land clearance to zero';</i> • <i>'By 2003, all jurisdictions:</i> <ul style="list-style-type: none"> ◦ <i>'have clearing controls in place that prevent clearance of ecological communities with an extent below 30% of that present pre-1750; and</i> ◦ <i>'have programs in place to assess vegetation condition'.</i>

Jurisdiction	Strategy, Policy or similar instrument	Relationship to matters in this study
State	<i>Flora and Fauna Guarantee Act 1988</i>	The FFG Act has negligible direct influence on conservation of flora or fauna in Boroondara. However, it provided a basis for <i>Victoria's Biodiversity Strategy</i> – see below.
	<i>Victoria's Biodiversity Strategy (1997)</i>	This strategy provided the context and basis for the Native Vegetation Framework, which is more specifically and directly relevant to the present study.
	The Victorian Native Vegetation Framework (NRE 2002a and supporting documents)	The report you are reading uses methods to describe and assess natural habitat that are prescribed in the Framework, and provides information that should assist greatly in implementation of the Framework.
	<i>Catchment and Land Protection Act 1994</i>	This Act led to the preparation of Regional Catchment Strategies, the Catchment Management Authorities and the regional strategies and plans listed below.
	<i>Victoria Planning Provisions (VPPs)</i> , which form a substantial part of the Boroondara Planning Scheme	The VPPs provide some native vegetation with basic protection from removal or destruction. This has been taken into account when considering what other protection is needed by native vegetation in Boroondara.
Regional	<i>Port Phillip and Western Port Regional Catchment Strategy of 2004</i>	This strategy sets five objectives for biodiversity in the region, all of which are supported by the present report: <ol style="list-style-type: none"> 1. 'Achieve a net gain in the quantity and quality of indigenous vegetation; 2. 'Maintain the diversity of indigenous habitats and species in terrestrial, aquatic and marine environments; 3. 'Achieve sustainable populations of indigenous flora and fauna species; 4. 'Improve the connectivity and long-term security of indigenous habitats and species; 5. 'Encourage intelligent use of introduced flora and fauna species with minimal impacts on indigenous habitats and species'.
	<i>Port Phillip and Westernport Native Vegetation Plan of 2006</i>	Not yet published. It is already an incorporated document in the Victoria Planning Provisions, thereby affecting the Boroondara Planning Scheme. The author has been provided with late drafts of sections relevant to this report. It places new emphasis and force on retention of existing native vegetation and the use of revegetation, both of which should be assisted by the present report.
Municipal	<i>Council Plan 2002-2005</i>	Objective 2.3 is to ' <i>Research the City's tree canopy and protect and preserve significant vegetation, landscapes and natural assets</i> '. The present report helps identify the biologically significant natural assets and provides recommendations to protect and preserve them.
	<i>Biodiversity Strategy (Context 2003)</i>	Item 1 in the Action Plan within the Biodiversity Strategy (p.24) set most of the parameters and scope of the project reported here. The Biodiversity Strategy includes an inventory of flora and fauna and descriptions of the types of vegetation in Boroondara, but the present report has been compiled with much greater effort, thoroughness and quality control.

Jurisdiction	Strategy, Policy or similar instrument	Relationship to matters in this study
Municipal	<i>Biodiversity Corridors Plan (Context 2004)</i>	Examined ecological linkages across Boroondara and proposed an action plan of planting and habitat rehabilitation to strengthen those linkages.

1.5 The Study Approach

This study began with a literature search and discussions with people who might provide information not available elsewhere. This process is described in Section 2.2. It provided a guide to what natural assets should be sought during the fieldwork or taken into account later in the study.

The second, overlapping stage of the project involved extensive fieldwork to provide reliable, current information about Boroondara's biological assets. The fieldwork approach is described in Sections 2.4 and 2.3, and the results are summarised in Chapter 3. In the process of travelling the municipality to survey sites, some additional sites were identified and added to the project's scope.

The fieldwork also helped greatly to determine the reliability and current-day relevance of past records of native flora and fauna in Boroondara. It became apparent that some species had been repeatedly recorded erroneously, and that others needed further effort to determine whether they were accurate or not. This led to several weeks' work researching the origins of questionable or anomalous records to determine whether they were sufficiently reliable to accept. This process involved numerous contacts with past investigators and is described in Section 2.2.

All the available flora and fauna data from this study's fieldwork and the verified records of previous work were accumulated into databases, one for flora and another for fauna. The databases were analysed and combined with ecological knowledge from literature and the author's experience to assess each species' conservation status (endangered, vulnerable, secure etc.) within the municipality. After assigning a conservation status to all the species (with a few unavoidable exceptions), summary statistics and a broader view of the conservation status of Boroondara's native species emerged.

Once all the information about species, sites and communities had been gathered, documented and analysed, it became possible to formulate a municipal-scale view of Boroondara's natural assets and their trends, threats, conservation needs and priorities. This led to the identification of some strategic issues and recommendations for dealing with them, which are given in Chapter 4. This includes the compilation of a table of recommended species for revegetation and indigenous amenity plantings in Boroondara, which is presented in Appendix C.

2. Scientific Methods



2.1 Extent of Coverage

Biodiversity comprises the full range of species, communities and genetic material represented by living things, right down to microorganisms. In designing a study of biodiversity such as this, a decision has to be made about what can be surveyed within the available budget and time to provide the best indication of overall biodiversity and ecological wellbeing.

This study adopted the usual approach of putting greatest effort into a detailed survey of the vegetation (excluding fungi and algae) and the habitat that the vegetation provides for native fauna. Mosses and liverworts were only sampled sparsely, providing rudimentary information about their species and diversity. These surveys occurred from October 2004 to March 2005.

Fauna were surveyed less thoroughly than vegetation. Birds were surveyed intensely at many sites (the ones with more habitat), but only for a dozen or so days of work during spring. Spotlighting was conducted at some sites to detect owls, frogmouths, bats, possums, frogs and other nocturnal wildlife. Other observations of birds, mammals, reptiles, frogs and butterflies were recorded incidentally during the vegetation surveys.

The main reasons for the emphasis on surveying vegetation rather than fauna in this study were that:

- The type and condition of vegetation largely determines the richness and wellbeing of fauna;
- Only a fraction of the total fauna can be observed in any short-term study like this; and
- Previous studies and the Atlas of Victorian Wildlife provide a fuller and more reliable representation of fauna than the available sources of information about vegetation (provided that quality control is applied).

The fieldwork included all fifty-eight sites described in Chapter 5 as well as several locations with small patches of native vegetation (e.g. nature strips and residential allotments). However, fieldwork in Yarra Bend Park (the most biologically significant site in Boroondara) was rudimentary, having been excluded from the project brief because:

- The park's conservation, management and monitoring are the responsibility of Parks Victoria; and
- The park's indigenous flora and fauna have been thoroughly investigated in recent years (Beardsell 1997, 2003).

Nevertheless, pre-existing biological information about Yarra Bend Park was examined in detail to extract information that was reliable and relevant to Kew in the current day (noting that some flora and fauna records originate from the parts of the park that are outside Boroondara).

Scotch College was also surveyed incompletely, because it had to be inspected from the fenceline.

A list of sites to investigate formed part of the project brief, based on the list in Appendix A of Boroondara's Biodiversity Strategy (Context 2003). These sites were augmented by several others detected during the course of the study, one of which – the Yarra River flats between Burke Rd and Kew Golf Club – was found to be one of the most biologically significant sites in Boroondara.

It is still possible that a patch of significant habitat or a population of a rare plant or animal could have escaped detection. The unsurveyed sections of the Lilydale-Belgrave railway reserves seem the most likely areas to support something significant.

Even within the sites whose vegetation was intensively surveyed, it is possible that rare flora or fauna may remain undiscovered. The full diversity of flora and fauna in a site is rarely visible in a single six-month period, and this is particularly so in the case of wetlands not seen in a dry state. Even though wetland sites were scheduled for surveying in January and February – the optimal time of year for wetlands – two floods upset these plans and left the Yarra billabongs full until April. The huge load of silt dumped on the vegetation by the floodwater, up to five metres above ground level, may also have obscured some species.

It is a general rule of ecological surveys that there are always new and exciting things to discover, and the author hopes that this report inspires people to seek them rather than regard this report as complete.

2.2 Survey of Literature and Pre-existing Information

The following sources of information were used in this study:

Flora

- Pressed plant specimens and the associated 'MELISR' database at the National Herbarium of Victoria;
- The Department of Sustainability & Environment's botanical database called the Flora Information System;
- Plant records in the standard reference, '*Flora of Melbourne*' (Gray and Knight 2001);
- The Yarra Bend flora study by Beardsell (2003), along with extensive discussion with Mr Beardsell to verify records and determine which species were found in the Boroondara part of the park;
- Updated flora information for Yarra Bend Park from Peter Lynch (the park's Head Ranger);
- Discussions with representatives of Yarra Bend Park, neighbouring Councils, the National Herbarium of Victoria and various Friends groups;
- Discussions with numerous people who have recorded flora in Boroondara;

Fauna

- The Department of Sustainability & Environment's fauna database called the Victorian Faunal Display (a version of the Atlas of Victorian Wildlife for use outside the department);
- The Yarra Bend fauna study by Beardsell (1997), along with extensive discussion with Mr Beardsell about it;
- Updated fauna information for Yarra Bend Park from Peter Lynch, as well as clarification of which species have been seen in the Boroondara part of the park;
- Month by month bird lists from Yarra Bend Park from July 1990 to December 1992 from the Bird Observers Club of Australia;
- A written report titled 'Preliminary Results for Terrestrial Invertebrate Survey of Yarra Bend Park' by the Terrestrial Invertebrate Group of the Field Naturalists Club of Victoria, dated 15th October 2004, as well as discussions with two of the report's three authors;
- Field notes of insect observations in Camberwell during 1971-1991 by Ian Faithfull;
- Discussions with representatives of Yarra Bend Park, neighbouring Councils, the Bird Observers Club of Australia, Birds Australia, the Field Naturalists Club of Victoria and various Friends groups;
- Discussions with numerous people who have recorded fauna in Boroondara between 1938 and 2004;

Sites

- Data from the Department of Sustainability & Environment's 'BioSites' database (NRE 2002b, DSE 2005b) concerning Beckett Park, Dights Falls, Yarra Bend Park, Hays Paddock and the Yarra floodplain downstream of Burke Rd;
- Various documents about particular sites within Boroondara, as listed at the end of each site's description in Chapter 5;

General

- References listed as relevant to Boroondara by McDonnell *et al.* (1999);
- Other publications listed in the Bibliography (p. 74).

As explained in Section 1.5, the information sources above were not accepted blindly as reliable but their contents were checked thoroughly before being accepted.

The largest quantity of data from any single source was from the Department of Sustainability & Environment's wildlife database, the Victorian Faunal Display. This was the source of the fauna list in Boroondara's Biodiversity Strategy (Context 2003). It contains over one thousand separate lists of fauna observations within Boroondara, with a total of over six thousand records of species. Every one of these lists, and every list with coordinates lying within or near Boroondara, was checked for its reliability. Some had inaccurate coordinates and were not actually from within Boroondara. Some are district lists that include fauna species from both inside and outside Boroondara. Most lists have an ending date but no beginning date, and so a list dated 2004 (say) might contain very old records that have not been repeated since. There are also records of highly unexpected species, raising questions about possible misidentifications or typographical errors.

Wherever there was doubt about a record for reasons like those just discussed, or because it was unique or extremely unusual in Boroondara's history, the author discussed it with the observer (if they were alive) or attempted to validate it through other means such as reading associated documentation or visiting the site. This allowed many records to be confirmed, invalidated or put in proper context; e.g. veteran ornithologist Fred T.H. Smith explained unique records of Grey Goshawk and three honeyeater species in 1983 as vagrants moving through Yarra Bend Park after having been displaced by the 1983 drought and bushfires. Many very unusual records were found to be vagrants, often just flying overhead, without this being properly recorded in the database. It is very important to know this sort of context in order to determine the conservation status of the affected species and whether there are any implications for management of its habitat.

Fauna records from sources other than the Victorian Faunal Display were checked similarly. Overall, the process of validation of fauna data took two or three weeks of work.

The same sort of checking of flora data took similar time and effort as the fauna data, despite there being about half the number of species records. This is because there are additional complexities involved with plants:

- Plants tend to be more commonly misidentified than fauna;
- Taxonomy of plants (that is, their naming and classification) is more subject to change than fauna, leading to faults in translating names of species from old lists into the *correct* current-day names. For example, in recording the published flora list of Muir (1976) for the Alamein railway reserve into the Flora Information System, the identity of several species was wrongly translated from 1976 taxonomy to current-day taxonomy (e.g. *Danthonia linkii* should have become *Austrodanthonia fulva* but was instead translated to *A. bipartita*);
- Horticultural specimens sometimes appear in the Flora Information System, which has no facility to record whether a plant has been planted or is natural. (The author's database does have this facility.) This problem particularly affects the Flora Information System's data from Beckett Park and Maranoa Gardens, where many of the gardens' specimens are recorded without distinction from naturally occurring species. Some such cases can be clarified by a site inspection, investigation of an associated report or discussion with the data collector. Other times, there is no way of telling the origin of a plant, as in the case of some eucalypts over a century old which could have been planted by pioneers. This problem is increasing rapidly as revegetation becomes more common and mature, particularly where planted specimens produce progeny in areas that have not been planted.

In many cases, misleading plant records became apparent when the author visited sites. For example, T.B. Muir's 1976 list of plants for Ryburne Avenue Reserve in Ashburton included the ecologically improbable species, *Dillwynia glaberrima*, whereas the author found a very old plant of *Dillwynia cinerascens* that was evidently misidentified by Muir. Muir's list also included a remarkable record of the lily, *Thelionema caespitosum*, which is not there in 2005 and could possibly have been a true record, or perhaps just a misidentification of another blue-flowered lily, *Dianella admixta*, which is still common at the site but was strangely absent from Muir's list. These are fairly typical examples of the complexity of interpreting flora records. The author has taken a 'balance of evidence' approach to deciding whether to include or exclude anomalous records from the inventory provided in this report.

Even the catalogue of specimens at the National Herbarium of Victoria should not be taken at face value. Expert botanists identify specimens at the herbarium and carefully re-identify them when there is a change in taxonomy. However, collectors of specimens sometimes mislabel the collection locations, and occasionally coordinates of the collection locality are inaccurately entered into the catalogue database.

A literature survey was conducted to investigate previous studies' classifications of vegetation communities and habitat types. A specification for this project was to relate the vegetation to the classification scheme of

‘Ecological Vegetation Classes’, or EVCs, that has recently become the standard in Victoria. Two studies have applied this scheme in Boroondara. One is the Yarra Bend Park study of Beardsell (2003), who performed some rearrangement and subdivision of the standard EVC system. The other is the ‘BioMap’ project of Oates and Taranto (2001), who warn that their mapping was only a ‘first draft’ that had not been subjected to the intended degree of ground-truthing. As noted by Beardsell (2003), the BioMaps do have faults in Boroondara. This is immediately recognisable from the substantial mismatches between the ‘extant’ and ‘pre-1750’ BioMaps, which result from the former being prepared by someone less experienced in this sort of vegetation mapping.

The Department of Sustainability & Environment has estimated the current and pre-European extent of each EVC within each bioregion, in hectares. The figures are likely to be fairly robust to inaccuracies in the mapping of EVCs, due to the summation of areas within whole bioregions. From these figures, the department has applied a formula given in the National Native Vegetation Framework and the Victorian Native Vegetation Framework (NRE 2002a) to determine the ‘conservation status’ of each EVC in each bioregion, using categories of ‘Presumed Extinct’, ‘Endangered’, ‘Vulnerable’, ‘Depleted’, ‘Rare’ and ‘Least Concern’. The resulting classifications of the EVCs were obtained from an internal departmental document that is soon to be published in the Port Phillip and Westernport Native Vegetation Plan. They are used in determination of each site’s biological significance level (Section 2.6).

2.3 Vegetation Surveys

All but two of the fifty-eight sites described in Chapter 5 were surveyed thoroughly for their native vegetation and habitat values. The two sites that were not intensely surveyed were Yarra Bend Park (for the reasons discussed in Section 1.1) and Scotch College (which had to be inspected from the fenceline). The remaining sites were surveyed during October 2004 to March 2005, the later months being used for sites with wetlands that usually do not reveal much of their flora during spring. However, as noted in Section 2.1, the plan to survey wetlands when they were dry was thwarted by two floods, which left the Yarra billabongs full until April. The huge load of silt dumped on the vegetation by the floodwater, up to five metres above ground level, may also have obscured some species.

The tasks undertaken were to:

- Map boundaries around the areas of biological significance, matching property boundaries where practicable;
- Map the parts of each site covered by each different type of vegetation;
- Describe the vegetation structure and composition within each vegetation type in detail so that it could be classified correctly and transparently (Section 2.3.1);
- Record a thorough inventory of species of indigenous plants and environmental weeds within each vegetation type, and often within each separate area of each vegetation type (Section 2.3.2);
- Record the severity of environmental weeds using a four-level scale (Section 2.3.3);
- Record the population status (typically population size, security and threats) of each species that was thought to be rare or threatened in Boroondara;
- Map and measure any remnant trees that the author thought might reach the threshold size for a ‘large old tree’ as defined by the Department of Sustainability & Environment, as well as documenting the tree’s health and special habitat values (such as the presence of hollows);
- Assess and describe the ecological condition of the vegetation, sometimes with a map to show areas of different ecological condition;
- Record all fauna observed during the survey (Section 2.4.3);
- Record wildlife signs and habitat features (e.g. tree hollows, logs or food plants);
- Indicate threats to the significant attributes of the site (e.g. tree dieback or over-frequent slashing);
- Provide management recommendations for conserving the significant attributes; and
- Decide on, and obtain, appropriate data to assist ongoing monitoring of the site (e.g. quadrat data or photographs).

The native vegetation at some sites is reduced to remnant old trees with scattered native grasses in a lawn. In these cases, some of the tasks above became trivial.

2.3.1 Delineation and Classification of Vegetation Types

One of the first tasks in assessing each site's vegetation and habitat was to determine boundaries between different types of vegetation and characterise each type in detail. As specified in the project brief, vegetation was classified using the Department of Sustainability & Environment's system of Ecological Vegetation Classes, or EVCs – sometimes subdivided further into narrower categories called floristic communities.

For each patch of each type of vegetation within a site, a list was compiled of all species of indigenous plants and environmental weeds. Additional information was recorded about the structure and composition of each vegetation stratum as well as relevant geophysical parameters, as per the following excerpt from the field data sheet that was used:

<p>Vegetation Community or Area: <e.g. 'Floodplain Wetland – billabong beside the 10th fairway'></p> <p>Geology, soil & topographic determinants:</p> <p>Uppermost trees (species, height, density):</p> <p>Lower trees / large shrubs (species, height, density):</p> <p>Shrubs:</p> <p>.....</p> <p>Vines / climbers:</p> <p>Ferns:</p> <p>Ground flora – dominant species:</p> <p>.....</p> <p>Ground flora – other abundant species:</p> <p>.....</p> <p>Ground flora – total % coverage by all species: Richness:</p> <p>Non-dominant character spp and indicator spp:</p> <p>.....</p> <p>Understorey partitioning between heathy shrubs, other shrubs, grassy spp., tough sedges &c:</p> <p>.....</p> <p>Visibility (typical distance within which one can readily see a person walking):</p> <p>Percentage in ecological conditions A to D:</p> <p>Likely deviations from natural state:</p> <p>.....</p> <p>Notes:</p> <p>.....</p>

Where the vegetation is not too modified from a natural state, the data collected on the above data sheets is suitable for matching up with the description of one or another EVC, as provided in either Appendix A or Oates and Taranto (2001). The data can also be compared with the Department of Sustainability and Environment's 'benchmark' description of the relevant EVC within the Gippsland Plain bioregion (which includes all of Boroondara).

2.3.2 Detection and recording of plant species

This study adopted the usual approach of performing a detailed survey of the vegetation (excluding fungi and algae) and the habitat that the vegetation provides for native fauna. Mosses and liverworts were only sampled sparsely, providing rudimentary information about their species and diversity.

Some plants cannot be identified reliably to the level of an individual species, e.g. because they are aberrant for their species or are not at the right stage of growth to reveal a critical diagnostic feature. Some species are so inherently difficult to classify that the distinction between the species is still not fully understood by science.

Therefore, small specimens were taken of many plants whose identity had to be confirmed in the author's offices, or where there could be some question about the authenticity of the record. One hundred and thirty-two such specimens have been preserved and most of them have been lodged with the National Herbarium of Victoria for permanent curation.

The identification of each species recorded in this study was given a confidence level, with 100% representing certainty.

Geraniums pose a particular difficulty because several of the locally indigenous species have not been formally described and are under scientific review by the Australian expert on geraniums, Lynlee Smith. Ms Smith was engaged to identify all the geranium specimens collected in this study.

Sun-Orchids pose similar difficulties, and so flower specimens of each colony in Boroondara were checked by sun-orchid expert, Jeff Jeanes, at the National Herbarium of Victoria, within a day of collection.

In some cases, it is hard to be sure whether a plant has been planted, is natural or is the result of proliferation from planted specimens. Sometimes it has been possible to clarify the situation by obtaining historical records or contacting people who have a long involvement with the area in question. On other occasions, a judgement has been made based on the ecological likelihood of natural occurrence in that area. This still leaves some cases where the origin is uncertain, including important cases such as the Melbourne Yellow Gums (*Eucalyptus leucoxydon* subsp. *connata* – which is officially listed as vulnerable) growing at Grace Park in Hawthorn and near Hartwell railway station.

Introduced species were recorded with differing degrees of thoroughness depending on the state of the vegetation. Only serious weeds were noted where few indigenous plants remained, whereas full lists of weeds were compiled for the most intact vegetation.

All records of wild plants (i.e. excluding those which have been planted) will be provided to the Department of Sustainability & Environment for inclusion in its Flora Information System, in return for the department having made its data available to the author.

2.3.3 Weed Severity

The level of threat or impact of each species of environmental weed recorded at each site was rated according to a four-level scale:

- ‘**Very Serious**’: Currently becoming denser and/or more widespread, to the extent that the vegetation's current value for indigenous flora or fauna is expected to suffer a very serious reduction within the next few years if new measures are not introduced to control this species. This excludes weeds that have already done such damage but are no longer actively and very seriously replacing the remaining indigenous flora and fauna;
- ‘**Serious**’: Seriously diminishing the vegetation's future value for indigenous flora or fauna by either causing active deterioration or preventing ecological recovery, or else likely to become very serious (as defined above) within 5-10 years if preventative action is not taken;
- ‘**Moderate**’: Causing significant (but not serious) diminution of the vegetation's value for indigenous flora or fauna by either: (a) causing active deterioration or preventing ecological recovery; or (b) having a strong chance of becoming serious (as defined above);
- ‘**Insignificant**’: Not representing any significant ecological threat, e.g. weeds that are expected not to spread beyond the edges of paths and tracks.

This is very similar to the scale of Carr *et al.* (1992), except that it is more explicit about whether the harm being caused is present or potential, and it makes provision for plants that are currently causing moderate (not serious) harm with no indication of becoming serious in future. The ‘Moderate’ category above corresponds to Carr *et al.*'s ‘P’ (potentially serious) category and the ‘Insignificant’ category above corresponds to Carr *et al.*'s ‘N’ (not a threat) category.

Note that the past effects of environmental weeds are not taken into account in this classification system. For example, consider an area that has been reduced to just vestiges of indigenous flora due to decades of competition by pines and has reached a rather stable state. Although the accumulated effect of the pines may have been very serious, this was in the past and a 'Very Serious' rating would be inappropriate under the approach adopted here. However, if the observer believes that the indigenous habitat could recover if the pines were removed, then a 'serious' designation could be applied because the pines are a serious impediment to the future value of the site for flora or fauna.

This system of rating environmental weeds across the municipality provides a scientific basis for assessing which species are presently causing greatest ecological harm or threat. This is more useful for developing policy and strategies than a classification scheme that takes into account how much harm has been caused by each species in the past (e.g. those based on percentage cover of weed species).

2.3.4 Vegetation Quality and Condition

The 'quality' or ecological condition of vegetation was assessed using the new Victorian standard method of 'habitat scores' where practicable, with a fallback of an alternative method.

Habitat Scores

The 'habitat score' is a measure of vegetation 'quality' developed by the Department of Sustainability & Environment (DSE 2004). It takes into account the vegetation's ecological condition, the presence of logs and large old trees, the extent of contiguous native vegetation and connectivity to other areas of native vegetation. It plays a critical role in the Victorian Native Vegetation Framework (NRE 2002a), which is directed toward achieving a net gain in the quality and quantity of native vegetation across the landscape. For these purposes, vegetation quality is to be measured by the habitat score.

A critical aspect of measuring habitat score is comparison between the vegetation under consideration and a 'benchmark' description of the composition of the relevant Ecological Vegetation Class (EVC) in a mature, long-undisturbed state. If the wrong EVC is diagnosed, then the comparison against the benchmark will be artificially poor and a false, low score will result. It is therefore important not to rely on the Department of Sustainability & Environment's BioMaps of EVCs in Boroondara, which have faults.

A habitat score can only be validly determined for an area, called a 'habitat zone', that supports a single Ecological Vegetation Class and that is fairly uniform in its ecological characteristics, taking into account tree density, diversity of plant sizes and forms, weediness, degree of natural regeneration of flora, organic litter cover and presence of logs.

A single site may have many such zones, and so multiple habitat scores have been determined for some of the sites described in Chapter 5. In some other sites, no habitat score has been determined because the cover of native understorey does not reach the threshold of approximately 10% to be deemed suitable for application of the habitat scoring method.

A habitat zone should ideally cover at least one thousand square metre, otherwise the score can be artificially marked down. For example, by comparison with a benchmark intended for a larger area, a small area may, solely because of its size, naturally have:

- fewer species in each life form class; or
- fewer species regenerating; or
- fewer large old trees (due to natural patchiness in tree distribution).

These factors have been taken into account when deciding whether to determine a habitat score in small habitat zones. In Boroondara, the ecological condition of native vegetation is typically extremely patchy, making the habitat zones very small indeed. Because of the scale problems above, and because of the disproportionate amount of time and effort required to determine a habitat score for a tiny area, an alternative to the habitat score is described in the following subsection (headed 'Ecological Condition').

The vegetation in Boroondara's wetlands is usually in the same category of small areas with a high degree of patchiness. In addition, the EVC classification system is not well developed for wetlands and there is a paucity

of appropriate benchmarks – understandably, since the character and visibility of wetland vegetation can vary greatly week by week as water levels rise and fall. These factors prevented determination of habitat scores for wetlands in Boroondara, which is unfortunate for such an ecologically important ecosystem type.

There are no guidelines for how to determine habitat scores for revegetation. Issues that arise include:

- Revegetation areas are often small enough for the scale problems just discussed to be manifest.
- Which EVC's benchmark should be used, given that revegetation may have been (quite reasonably) designed not to match some 'benchmark' state, but to maximise habitat value and conservation of rare species in a heavily modified environment?
- Should a revegetation area be marked down because it has mulch at a density exceeding the 'organic litter' cover in any benchmark (and quite properly so)?
- Habitat scores give no credit for the presence of rare or threatened plant species, even though the value of planting such species is well recognised.

In the absence of resolution of issues like those above, habitat scoring has not been applied to revegetation areas in the present study.

Ecological Condition

Because of the limitations of the habitat scoring method discussed above, the ecological condition of vegetation was sometimes assessed in this study using a simpler and more qualitative method, following Lorimer *et al.* (1997) and Lorimer (2004). This method measures the ecological condition of vegetation, but does not directly take into account other aspects of the habitat score, namely logs, large old trees, the extent of contiguous native vegetation and connectivity to other areas of native vegetation – all of which are separately documented in each site's assessment in Chapter 5.

It dispenses with the obstacle of absent benchmarks by allowing the assessor to make a guided, qualitative comparison against their own expectation of what the pristine composition of the vegetation would be. This means that a higher level of ecological expertise is required than for determining the habitat score, but it is much quicker and can be applied to areas as small as a few square metres.

The method relies on the observation that human modification of a natural environment generally causes a reduction in biodiversity (i.e. the range of species and genetic variation present) and a shift from native to introduced species. Plants are very good indicators of this process, as indigenous plants become replaced by weeds and the total number of plant species declines.

This process can go through several stages. With low-level disturbance, a few sensitive indigenous plant species disappear, while most other species survive and reproduce. With greater disturbance, the number of lost indigenous species increases and some of the remaining ones struggle to reproduce, typically because their seedlings are out-competed by weeds. A stage may then develop where half or more of the indigenous species die out, leaving only hardy species that can survive the effects of weed invasion and loss of the native fauna that provide pollination and pest control. If earthworks or similar activities are conducted, only the hardiest plants are likely to survive (such as isolated remnant trees in gardens), and these generally gradually decline because they cannot reproduce effectively (e.g. tree seedlings being mowed).

These observations led the author to devise a scale from A to D based on the position of vegetation in the stages of degradation just described. The ratings are designed to be easily determined in the field, provided that the assessor has expert knowledge of the pristine state of the type of vegetation being assessed. The assessor considers the following two factors:

- The number of indigenous plant species remaining compared with expectations of a pristine site of the same size and vegetation type; and
- The ability of the indigenous species present to survive and reproduce, as evidenced by the presence of multiple generations of species, and signs of natural regeneration.

The categories are:

Rating A: Contains almost all of the indigenous plant species that one could expect to occur in that type of vegetation (taking into account the size of the area); at least 80% of plant species able to reproduce

adequately to maintain their numbers. To aid readability, this is generally represented in the site assessments of Chapter 5 as 'ecological condition A (excellent)'.

Rating B: Contains at least half of the indigenous plant species that could be expected, but not reaching rating A due to loss of species or reproductive failure. Better management and some revegetation can usually raise the rating to A. This is generally represented in Chapter 5 as 'ecological condition B (good)'.

Rating C: Contains less than half of the indigenous plant species that could be expected, but more than about 20%; most of the indigenous plants are likely to be able to reproduce successfully. This is generally represented in Chapter 5 as 'ecological condition C (fair)'.

Rating D: Contains less than half of the indigenous plant species that could be expected, frequently less than 20%; reproduction of most of the indigenous plants is usually seriously impeded. These areas usually have value only for landscape and hardier wildlife. This is generally represented in Chapter 5 as 'ecological condition D (poor)'.

In marginal cases, attention is focused on the plant species that are expected to play the most important ecological role, such as the naturally dominant species in the overstorey and understorey. If the loss of biodiversity is particularly evident among the most ecologically important species, the lower ranking is assigned.

The ecological condition scale above is intended to provide a good workable indicator of the value of a site for conservation of biodiversity. Note that it differs from most indicators of vegetation 'quality' published elsewhere, in that it does not downgrade a site solely for the presence of weeds. For example, many wetlands in Boroondara have a relatively high density of weeds in a stable coexistence with high numbers of indigenous species. The ecological condition rating may be 'B' in such a case, despite the weediness, because the indigenous plants are secure. This is consistent with the intent of the Department of Sustainability & Environment's 'habitat score', which places substantial importance on the diversity of indigenous species. By contrast, the more traditional 'vegetation quality' indicators would rate such a site as being of poor quality solely because of the significant proportion of weeds.

The ecological condition scale above places value on conservation of biodiversity, not on naturalness. A site such as the one quoted above may disappoint people who value natural appearance very highly, but that is a secondary consideration for the objectives of this report.

2.3.5 Large Old Trees

The Department of Sustainability & Environment's habitat score method awards points to vegetation for the presence of large old trees, which are defined as having trunk diameters (measured 1.3 metres above ground level) above a threshold specified in the benchmark for the relevant Ecological Vegetation Class. For most native vegetation in Boroondara, the threshold diameter is 0.8 metres, equivalent to a girth of 2.51 metres. In practice, girth is measured rather than diameter.

One of the tasks in the fieldwork for this study was to measure the girth of any tree that appeared to be a contender for the status of a large old tree. Heights were also measured in many cases, using a clinometer. The health of each tree was assessed qualitatively as either very good, good, fair or poor. This was judged on the basis of crown foliage cover, trunk decay and other signs of disease. Structural factors such as bifurcations with included bark were not taken to reflect on the health of the tree if there were no signs of pathology. The assessment was intended to reflect biological value and expected longevity, not the safety of humans.

Note that some of the features that lead arborists to condemn trees in urban situations are the same features that make them very important habitat trees. This particularly applies to the presence of hollows.

Many of the large old trees were photographed during their assessment, which should assist future monitoring.

In some of the sites in this study, the only areas of biological significance are large old trees surrounded by exotic vegetation such as park lawns. In such a case, the site boundary comprises a circle around the base of each large old tree, representing a Tree Protection Zone. The radius of each tree protection zone is eighteen

times the trunk's diameter at breast height, based on the widely used formula of Matheny and Clark (1998) for an over-mature tree of high sensitivity to root disturbance.

2.4 Fauna Surveys

As discussed in Section 2.1, this study did not aim to provide saturation fauna survey across the whole of Boroondara. The approach taken was as follows.

2.4.1 Daytime Bird Surveys

Daytime bird surveys were conducted at fourteen sites that were chosen to be representative of the range of types and quality of habitat available in Boroondara. They included areas of wetlands, riparian forest, Red Gum grassy woodland, Maranoa Gardens (with its collection of Australian native plants) and amenity parks with remnant trees. The full list of sites where daytime bird surveys were conducted is:

Freeway Golf Course, Balwyn North	Markham Reserve, Ashburton	Hays Paddock, Kew East
Kew Golf Club, Kew East	South Surrey Park, Surrey Hills	Beckett Park, Balwyn
Willsmere Park, Kew East	Alamein railway line, Ashburton	Maranoa Gardens, Balwyn
River Retreat, Kew	Outer Circle Linear Park, Kew	Belmont Park, Canterbury
Nettleton Park Reserve, Glen Iris	Stradbroke Park, Kew East	

Ornithologist and biologist, David Lockwood, was contracted to conduct the daytime bird surveys according to the following protocol:

- Each visit commenced with active searching for birds and habitat features (e.g. food plants, tree hollows, or reeds for nesting waterbirds). This took less than 45 minutes at some sites and hours at others (e.g. Kew Golf Club). The bird species observed were recorded on a standard data sheet for the Atlas of Victorian Wildlife (accompanied by records of animals other than birds that were observed incidentally). Extensive notes were taken concerning the behaviour and habitat usage of the fauna detected and the threats that they face, as well as potentially important habitat features that were not observed in use. Mr Lockwood also sought any evidence of birds moving along 'corridors', such as a strong tendency for birds, or certain species, to move in particular directions. This was to test whether the 'wildlife corridors' that have been postulated in Boroondara actually function as corridors for bird movements.
- After gathering the above information at a site, Mr Lockwood determined one or two routes for conducting standard twenty-minute bird censuses (Loyn 1986). He then conducted the censuses and recorded the results, which allow a quantitative inter-comparison between the bird fauna of the various sites (Section 3.5.1).

The daytime bird surveys were conducted from 1st October to 12th November 2004. This is the optimum season for most birds of forests, woodlands and urban areas, but not for some nomadic or migratory bird species.

Following the bird surveys, Mr Lockwood prepared an overall assessment of the municipality's birdlife, including the principal determinants of what species occur where, what threats they face and what might be done to improve habitat. He also provided a commentary on the degree to which birds (or other fauna) use or rely on corridors in Boroondara.

2.4.2 Spotlighting

The following nine sites were selected for spotlighting to detect nocturnal wildlife:

Freeway Golf Course, Balwyn North	River Retreat, Kew	Markham Reserve, Ashburton
Yarra Flats, Balwyn North	Burke Rd South Reserve, Glen Iris	Stradbroke Park, Kew East
Willsmere Park, Kew East (twice)	Nettleton Reserve, Glen Iris	Hays Paddock, Kew East (twice)

Using the spotlight, the author actively searched the whole of the native vegetation in each site, except in the case of the Freeway Golf Course where only the river corridor was searched. In addition, a tape of calls of Southern Boobook Owl, Barking Owl and Powerful Owl (in that order) were played loudly in areas where there was any potential habitat for owls. Playing calls in this way can elicit a detectable response from owls, as if to a territorial intrusion; however no such response occurred in this study.

The spotlight beam attracted many insects (particularly moths), which in turn attracted Tawny Frogmouths and some bats.

The author also listened for calls of frogs and White-striped Freetail Bats during the spotlighting sessions. Most local species of frogs call more at night than during the day.

The data recorded included the numbers of each species, the means of detection, any evidence of breeding, any notable use of habitat, and estimates of the atmospheric conditions of wind speed, temperature, cloud cover and lunar phase.

The spotlighting was conducted between 12th October 2004 and 31st January 2005.

2.4.3 Incidental Observations

The author tried to be as observant of wildlife as possible while carrying out the vegetation surveys during hundreds of hours between September 2004 and April 2005. Birds, mammals, frogs, reptiles and butterflies were recorded whenever they were detected. There was a concerted effort to notice fauna habitat. Binoculars were carried at all times to assist bird observations. Butterflies were often briefly caught in a net to allow identification, before immediate release. Wetlands were approached silently so that frog calls could be heard. Obvious reptile habitat such as sheets of corrugated iron were raised to see what lay beneath. Despite the active searching, detection of snakes was always to the author's surprise.

2.4.4 Archival of data

The fauna data gathered in this study will be made available to the Department of Sustainability & Environment for inclusion in its Atlas of Victorian Wildlife, in return for the department having made its data available to the author. Faults in the department's pre-existing database have already been notified.

2.5 Conservation Status of Species

2.5.1 State and National

The conservation status of species (i.e. whether they are extinct, endangered etc.) in Victoria has been listed by the Department of Sustainability & Environment (2003, 2005). At the national level, there is a list of threatened species under the mandate of the federal *Environment Protection and Biodiversity Conservation Act 1999*, updated periodically as species are formally assessed or re-assessed under the Act's provisions. There are also national lists of the conservation status of most Australian fauna species in Action Plans prepared for the federal Department of Environment and Heritage (and its predecessors). These Action Plans cover:

- Bats (Duncan *et al.* 1999);
- Birds (Garnet & Crowley 2000);
- Butterflies (Sands & New 2002);
- Freshwater fishes (Wager & Jackson 1993);
- Frogs (Tyler 1997);
- Marsupials and monotremes (Maxwell *et al.* 1996);
- Reptiles (Cogger *et al.* 1994); and
- Rodents (Lee 1995).

The more recent of these Action Plans also list conservation statuses at the state level.

Plant species that are rare (but not threatened) at the national level were listed by Briggs and Leigh (1996).

All flora and fauna species recorded in Boroondara were checked against these state and national lists. The rare or threatened species are noted as such wherever those species are mentioned in this report.

Note that the national and state lists of rare or threatened species were compiled according to varying criteria for the various categories of threat. With the exception of the Victorian list for plants (DSE 2005), the more recent lists were based on the international standard criteria of the International Union for the Conservation of Nature (2001, 2003) – usually referred to as the Red List criteria.

2.5.2 Within Boroondara

As local government becomes increasingly responsible for protecting native habitat and species, it has become valuable for municipal Councils to know the conservation status of species within their jurisdiction. This has now become possible for plants and vertebrates in Boroondara because of the copious field data gathered during this study, coupled with previous studies of Yarra Bend Park by Beardsell (1997, 2003). This study has assessed the conservation status of each indigenous flora and fauna species in Boroondara according to the international Red List criteria.

To obtain a basic understanding of the meanings of the threat categories under the Red List criteria, note that in simplified terms, any species that has at least a one-in-ten likelihood of becoming extinct from the domain of interest (Boroondara, Victoria or the world) within 100 years is considered to be at least Vulnerable. The category rises to Endangered if (but not only if) there is at least a one-in-five likelihood of extinction within a period of twenty years or five generations of the species (whichever is longer, up to 100 years). The category rises to Critically Endangered if (but not only if) the likelihood of extinction rises to 50% within ten years or three generations (whichever is longer, up to 100 years).

For most species, the likelihood of extinction within fixed periods is not quantifiable, so the Red List guidelines provide alternative criteria that are intended to be equivalent but are based on more easily obtained parameters such as population size and range.

The term ‘threatened’ encompasses the categories of vulnerable, endangered and critically endangered. The most common reason for a species to be classified as threatened in Boroondara is small population size. In particular, many species are represented in Boroondara by less than 250 mature individuals (one of the Red List thresholds for an endangered species). The conservation status of many fauna species is improved by their immigration from outside; for example, some species are rated here as vulnerable whereas they would have been rated as endangered if immigration had been ignored. The Red List guidelines provide a procedure for determining when to reduce a rating by one or more categories due to immigration. In the case of plants, there is usually no significant immigration to downgrade the threat category.

Some species of plants are represented in Boroondara by very few naturally occurring individuals but larger numbers of planted specimens, e.g. *Goodenia ovata*, *Lomandra longifolia* and *Chrysocephalum semipapposum*. In such cases, the Red List criteria have been applied in two ways: firstly excluding planted specimens and then (following Red List guidelines) including specimens that have produced viable offspring within ecologically appropriate habitat. However, it turned out that the two approaches did not produce a convincingly different outcome for any species.

Note that the Red List criteria cannot be applied to arbitrarily small areas, because ultimately the numbers of individuals of even quite viable populations fall below the Red List thresholds for a threatened species. The size of Boroondara is at the lower limit of the Red List criteria’s applicability.

One of the Red List categories is ‘Least Concern’, which is further subdivided for the purposes of this study into:

Abundant – Many reproducing individuals, dispersed widely within the municipality and showing no decline;
and

Secure – Not as above, but still not known to face any significant risks of local extinction.

Another Red List category is 'Not Applicable'. Species that fall into this category have been subdivided in this study into:

Transient or Vagrant – Indigenous species rarely present in Boroondara, not finding suitable habitat;

Occasional Visitor – Indigenous species that make only minor use of habitat in Boroondara, usually not every year, and whose appearance in Boroondara can be regarded as a spill-over from habitat adjoining the municipality;

Pest – Introduced species having a significant adverse effect on indigenous flora or fauna; and

'I' – Introduced species that are not pests as defined above.

Pest plants have been further categorised according to a three-level scale of the level of impact or threat that they pose to indigenous flora or fauna (Section 2.3.3; Appendix C).

The author has classified flora and fauna species according to all the above categories, based on each species' biology and ecology coupled with estimates of current and historical population sizes, spatial distributions, frequency of reported observations and availability of suitable habitat. This took approximately five days, working as thoroughly as such a project allows, but there are still shortfalls compared with the formal guidelines for applying the Red List criteria. In particular the guidelines for formal documentation are not met (as in the case of the state-wide listings) and the population sizes of some species could be determined more precisely with additional effort.

On this basis, the conservation status ratings of species in Boroondara are tabulated in the appendices. Butterflies have not been classified pending the outcome of a current investigation of invertebrates by the Field Naturalists Club of Victoria, concentrating on Yarra Bend Park.

2.5.3 Within Greater Melbourne

Fauna

Beardsell's (1997) NEROC study assessed the conservation status of fauna in the greater Melbourne area. The geographical boundary that he chose covers most of the Port Phillip catchment, including most of the Mornington Peninsula but none of the Bellarine Peninsula. He did not use Red List categories, but his categories of 'regionally endangered', 'regionally vulnerable' can be translated roughly into the categories described above for Boroondara. The exception is his category of 'regionally rare', which appears to be intermediate between the Red List categories 'Near Threatened' and 'Least Concern'.

Beardsell's conservation status assessments for fauna in greater Melbourne are included in the tables of fauna in Appendix E. Note that his criteria for 'endangered' etc. are different from the Red List.

Flora

No authoritative list of the conservation status of flora in the greater Melbourne area was found during research for this report. Beardsell (2003) made an assessment of species that occur in Yarra Bend Park, and this is a useful guide for part of Boroondara's flora, but the classification is rather inconsistent with Red List criteria. Another useful source of information about the spatial distribution of species is the standard text, *Flora of Melbourne* (Gray and Knight 2001). Based on these reports and the present author's knowledge of each species, the flora inventory in Appendix B indicates certain species that are very likely to fall into one of the Red List's threatened categories if a rigorous assessment were to be done. There may well be other species in Boroondara's flora that would fall into this category if further analysis were to be done.

2.6 Site Significance Ratings

The biological significance of each site in Chapter 5 has been classified as 'Local', 'Regional', 'State' or 'National' according to the objective criteria employed by the Department of Sustainability & Environment (Amos 2004). These criteria are refinements of the draft criteria used for the department's BioSites database

(NRE 2002b). They provide a substantially more rigorous, objective and transparent basis for significance assessments than has traditionally been the case in Victoria.

The significance rating of a site should not be confused with the ‘conservation significance’ of a particular part of a site, as defined in the Native Vegetation Framework (NRE 2002a, Appendix 3). The latter uses a scale of ‘Low’, ‘Medium’, ‘High’ and ‘Very High’, and usually varies substantially from one part of a site to another according to ecological condition, the rarity of the vegetation type and similar factors. Thus, a particular part of a site may have a conservation significance (according to the Framework) that is ‘Low’ or even absent, even though the site as a whole may have State significance.

The criteria that are used for assessing the significance level of a site fall under the following headings:

- a) *Ecological integrity, viability and naturalness*: the importance of a site as: (a) a large and exceptionally intact example of its type; or (b) critical habitat for migratory or nomadic species (e.g. breeding sites) at the regional scale or wider; or (c) a refuge for displaced flora or fauna; or (d) a corridor or ecological stepping stone for movement of fauna, pollen or plant propagules; or (e) a location for restoration of disrupted ecological processes;
- b) *Richness and diversity*: for sites with exceptionally large numbers of species, families, vegetation types etc.;
- c) *Conservation Status*: the importance of a site in conserving species or communities that are listed as rare or threatened, or communities that are exceptionally mature;
- d) *Representative of an ecological community*: the importance of a particular site in demonstrating the principal characteristics or variability of an ecological community – e.g. showing features of a community at the limits of its tolerance, or occurring in particularly unusual circumstances; and
- e) *Scientific and educational value*: the importance of a site or species in contributing to wider understanding of natural history, by virtue of its use for research or as a type locality, educational resource, reference site, fossil site, etc.

A site may be significant under any or all of the criteria. The significance level assigned to the site is the highest level that is determined under any of the individual criteria, and for any part of the site.

A particularly important criterion for sites in Boroondara is the presence of a ‘remnant patch’ of an Endangered Ecological Vegetation Class (EVC), which confers State significance on several sites in the municipality. Amos (2004) specifies that the definition of the term ‘remnant patch’ is to be taken from an as-yet unfinished document from the Department of Sustainability & Environment with the running title, ‘*Operational guidelines: applying net gain in the planning system*’. The author expects that the forthcoming definition is likely to be the same as, or very close to, the one adopted here: A contiguous (or near-contiguous) area of at least 2,500 m² that has at least 10% native understorey cover throughout.

2.7 Monitoring Methods

The City of Boroondara wishes to monitor trends in the condition of the municipality’s native habitat and its more significant attributes. There is some pre-existing data available for comparison with the data gathered in this study, allowing an assessment of changes in the intervening years. However, this provides only a very incomplete indication of changes that could be occurring. Consequently, one of the objectives of this study was to provide baseline data suitable for broader ecological monitoring in the future.

Different types of monitoring data are appropriate for different purposes (e.g. to monitor the health of a tree as opposed to the population of a rare plant). Consequently, different purposes apply to different sites. The range of methods used are listed below, and the ones used at each site are indicated in Chapter 5.

Vegetation monitoring

- Photograph points, with the photographs’ locations, orientation and salient features recorded (e.g. ‘*The green patch in the foreground is predominantly Ferny Azolla*’);
- Lists of flora species in each part of a site (natural vegetation or revegetation), with a broad, qualitative measure of abundance for each species;

- Estimates of population sizes of indigenous species that are scarce within the site or more widely;
- Quadrats (intensive survey plots) measuring typically 30 m × 30m, within which all plant species are listed and their abundance recorded using a modified Braun-Blanquet scale;
- ‘Habitat score’ assessments (usually combined with a quadrat), as described in Section 2.3.4.

Tree health monitoring

- The most significant trees or large shrubs were photographed, measured and their health recorded qualitatively as ‘very good’, ‘good’, ‘fair’ or ‘poor’. The extent of disease and pest infestation (particularly psyllids and leaf miners) was recorded where relevant, along with other damaging influences such as floodwater, tractor damage, soil compaction or over-visitation by Noisy Miners.

Fauna monitoring

- Twenty-minute bird censuses (Loyn 1986), as described in Section 2.4.1.

3. Scientific Findings

3.1 Biogeographical Zones

The whole of Australia has been divided into 'bioregions' by the Interim Biogeographic Regionalisation for Australia (Thackway & Cresswell 1995). These bioregions have been revised in the last few years by the Department of Sustainability & Environment for use with the Native Vegetation Framework, placing Boroondara near the western extremity of the Gippsland Plain bioregion. The Victorian Volcanic Plain bioregion abuts Boroondara's western boundary from Scotch College to the Chandler Highway.

At a finer scale than the bioregions, the author has divided Boroondara into the biogeographical zones shown by different colours in Figure 1 (p. 2), according to patterns of geology, topography, soil moisture, soil type and the resulting types of vegetation and fauna.

Within each biogeographical zone, the pre-European flora and fauna at any particular location were primarily determined by topographic factors, such as steepness and the direction that the slope faces.

The characteristics of each zone are discussed in the following subsections.

3.1.1 Yarra Floodplain

This zone was once the floor of a lake that formed about 800,000 years ago when the Burnley Basalt flow dammed the Yarra River (Webb 1988). It retains the alluvium from the lake as well as more recent alluvium carried by the river since it broke through the dam near the Chandler Highway bridge (the latter being concentrated around the river bends).

The zone is characterised by its alluvial soil, flat terrain (apart from the river and billabongs), the incidence of major flooding and the characteristic native vegetation types.

The natural vegetation within this zone falls into two Ecological Vegetation Classes (EVCs): Floodplain Riparian Woodland and Floodplain Wetland Complex. The latter corresponds to billabongs and other depressions that punctuate the floodplain, most of which have been filled in or drained to varying degrees. Both these EVCs are listed as endangered in the Gippsland Plain bioregion, and there are highly significant remnants of both on the Yarra Floodplain in Boroondara (e.g. at Willsmere Park).

The floodplain was evidently once a corridor for the movement of certain wildlife, such as Lyrebirds, according to reports of early settlers. It remains the most important wildlife corridor in Boroondara today. It still supports Platypus and rare birds of riparian woodlands such as the Azure Kingfisher.

3.1.2 Gardiners Creek Floodplain

The floodplain of Gardiners Creek is covered with alluvial soil that has washed downstream during Quaternary geological time. The pre-European environment there probably differed from the Yarra floodplain due to the absence of lake deposits and the lower flows of Gardiners Creek. However, there is so little native vegetation left that the differences are obscured.

For the project described by Oates and Taranto (2001), Doug Frood mapped the pre-1750 vegetation on the Gardiners Creek Floodplain as entirely Floodplain Riparian Woodland, just as for the Yarra floodplain. Within areas of this EVC there would have been billabongs and depressions belonging to another EVC, Floodplain Wetland Complex. There is very little remaining of the Floodplain Riparian Woodland, and none of the Floodplain Wetland Complex, surviving today.

Commensurate with this decimation of native vegetation, there is little evidence of the characteristic pre-European fauna that no doubt once used Gardiners Creek as a corridor.

3.1.3 Grassy Undulations

Most of Boroondara comprises gently underlying terrain. The higher parts of the terrain are gentle knolls and ridges, typically 100 metres above sea level, and are mostly topped by sands (the 'Red Bluff Sands') that were deposited beneath a sea in the late Tertiary geological period (Webb 1988). Elsewhere in this zone, the bedrock is Silurian sandstone or mudstone from the Dargile and Andersons Creek formations. This bedrock is much more solidly cemented than the Red Bluff Sands, and has weathered to form thin, light grey loam topsoil over mottled clay subsoil.

The undulating terrain is lightly dissected by minor streams such as Back Creek. These streams have cut moderately steep banks and deposited sandy alluvium along their courses. There is often no floodplain, or only a narrow one that drains rather quickly after floods.

These conditions give rise to vegetation dominated by River Red Gums (*Eucalyptus camaldulensis*) with a densely grassy ground flora. Prior to European settlement, shrubs would have been moderately dense beside the creeks and on the Red Bluff Sands of the highest terrain, and mostly sparse elsewhere. As shown on the Department of Sustainability & Environment's BioMaps, the EVCs were:

- Creekline Grassy Woodland beside the creeks, grading into...
- Swamp Scrub at the upper reaches of some small creeks in Hawthorn;
- Grassy Woodland on most of the Red Bluff Sands; and
- Plains Grassy Woodland everywhere else.

There are sites described in Chapter 5 that contain living representations of all these EVCs.

The fauna would have been typical of lowland Victorian woodlands, with its characteristically rich bird and reptile fauna.

3.1.4 Yarra Bend

The western part of Kew, extending slightly beyond Yarra Bend Park, stands out in Boroondara for its bolder topography. This resulted from the most extensive folding and faulting of rocks in the Melbourne area, caused by the Tabberabberan Orogeny about 375 million years ago in the Middle Devonian geological period (Webb 1988). The steeper topography in this zone results in more rapid drainage, greater erosion and thinner soil than elsewhere in Boroondara, and hence different natural vegetation.

As in the 'Grassy Undulations' biogeographical zone, the hilltops have caps of Red Bluff Sands and the slopes have Silurian sandstones and mudstones of the Dargile formation. There are floodplains beside the Yarra River.

The most distinctive biological feature of the Yarra Bend biogeographical zone is the abundance of a form of Box - Ironbark Woodland dominated by the rare Melbourne Yellow Gum (*Eucalyptus leucoxyloides* subsp. *connata*), with many species of flora and fauna that are (and probably always have been) rare elsewhere in the Melbourne area. Another distinctive feature of the zone is the influences of the basalt plain on the opposite side of the Yarra River, manifest by the presence of numerous grass species that are absent or very rare elsewhere in the eastern suburbs (e.g. spear-grasses in the genus *Austrostipa* = *Stipa*).

As shown on the Department of Sustainability & Environment's BioMaps and in the report by Beardsell (2003), the EVCs in the Yarra Bend zone are:

- Floodplain Riparian Woodland beside the Yarra River where waterlogging occurs for extended periods;
- Riparian Woodland beside the Yarra River where the valley floor is narrow and flooding is brief;
- Plains Grassy Woodland on sheltered, lower slopes;
- Escarpment Shrubland on the steeper slopes above the river;
- Box Ironbark Forest on other slopes; and
- Grassy Woodland on the Red Bluff Sands that cap the hills and ridges.

3.1.5 Upper Valleys

The upper reaches of two valleys in the east of Boroondara have essentially the same sort of topography, geology and soil types as the Grassy Undulations biogeographical zone, but the flora differs due to greater rainfall and soil moisture availability.

These valleys are part of a 1-2 km-wide band of ecological transition that extends from Balwyn North, through Mont Albert and Wattle Park to Ashwood. The Department of Sustainability & Environment's BioMaps of pre-1750 EVCs in the Melbourne area show this band to have been covered almost wholly by Valley Grassy Forest. The area to the east is shown as predominantly Valley Heathy Forest, and the areas to the west and south are shown as predominantly Plains Grassy Woodland and Grassy Woodland. Valley Grassy Forest is intermediate in character between Valley Heathy Forest, Grassy Woodland and Plains Grassy Woodland. The subtle gradation between these EVCs and the paucity of remaining native vegetation makes the boundary of this zone shown on Figure 1 indicative rather than definite.

The alluvium that lies in narrow bands along the creeks in this zone is believed to have once supported Creekline Herb-rich Woodland (or Swampy Riparian Complex along Koonung Creek), but only hardy, widespread plant species persist today.

3.2 Habitat Types

The types of habitat detected or confirmed during this study comprise eleven Ecological Vegetation Classes (EVCs) as well as streams and still water with no visible vegetation.

Appendix F of Boroondara's *Biodiversity Corridors Plan* (Context 2004) provided a general description of each EVC that was thought to have occurred within Boroondara, but the present study found that the descriptions of the EVCs and their component floristic communities are not always correct in the context of Boroondara.

The Department of Sustainability & Environment's BioMap of pre-1750 EVCs was found to be accurate to within its intended spatial resolution of approximately 100 metres (but note that Yarra Bend Park was not inspected in any detail for this study). The BioMap of extant (or currently existing) EVCs is generally unreliable, particularly due to misidentification of EVCs.

The EVCs that have been identified in Boroondara during the present project are listed in Table 2 in order of the standard EVC numbering system, with their conservation status described. Their identifying features and other characteristics are described in Appendix A. The highest category of threat for EVCs is 'endangered', followed by 'vulnerable'.

Table 2. Boroondara's existing EVCs and their conservation status in Boroondara and the bioregion.

The bioregional conservation status is as listed by the Department of Sustainability & Environment in 2005.

EVC No	EVC Name	Bioregional Conservation Status	Distribution and condition in Boroondara
47	Valley Grassy Forest	Vulnerable	Tiny, greatly modified vestiges in Winfield Rd Reserve and around South Surrey Park.
53	Swamp Scrub	Endangered	A tiny, greatly degraded patch near the Glen Iris wetlands.
55	Plains Grassy Woodland	Endangered	Once common and widespread in Boroondara, the best remaining representation is in a handful of small and moderately degraded patches. Scattered old Red Gums from this EVC also remain on several parks and other properties.
56	Floodplain Riparian Woodland	Endangered	Extensive areas remain beside several km of the Yarra and some billabongs, in mediocre ecological condition.

EVC No	EVC Name	Bioregional Conservation Status	Distribution and condition in Boroondara
61	Box Ironbark Forest	Vulnerable	Confined to Yarra Bend Park; several tens of hectares in fair ecological condition.
68	Creekline Grassy Woodland	Endangered	Tiny, badly degraded vestiges remain in Ashburton and Glen Iris.
164	Creekline Herb-rich Woodland	Endangered	Reduced to a scattering of hardy native plants on Back Ck.
172	Floodplain Wetland Complex	Endangered	Scattered in billabongs along several kilometres of the Yarra floodplain, with several examples in good condition.
175	Grassy Woodland	Endangered	Tiny vestiges remain in fair ecological condition in Ashburton, Beckett Park and Yarra Bend Park
641	Riparian Woodland	Endangered	Narrow strips beside the Yarra River and Gardiners Creek; The Yarra Bend Park stand was not inspected.
895	Escarpment Shrubland (also known as Basalt Escarpment Scrub)	Endangered	There are tiny patches in mediocre condition in Ashburton and Kew as well as >10 ha in Yarra Bend Park (including extensive areas that are 'relatively intact', according to Beardsell 2003).

Some very important conclusions about remnant native vegetation in Boroondara can be drawn from Table 2:

- All remnant native vegetation in Boroondara belongs to EVCs that are officially listed as either vulnerable or (in most cases) endangered. These EVCs are mainly listed as endangered or vulnerable because they have been subject to extensive clearing and fragmentation, leaving only a tiny proportion of their original extent. They are not adequately reserved in parks to give confidence in their medium- to long-term survival. They can ill afford any further losses or deterioration in ecological condition, even in the case of rather small or degraded examples.
- Almost all sites in Boroondara that have a remnant patch of native vegetation are sites of State significance, even when the patch is heavily degraded. This is because the Department of Sustainability & Environment deems all remnant patches of endangered EVCs to be of State significance (Section 2.6). Patches of vulnerable EVCs are also deemed to be of State significance if their quality is good enough, and this probably applies to the areas of Box Ironbark Forest in Yarra Bend Park that Beardsell (2003) describes as 'relatively intact'.
- The vegetation that now represents most of the EVCs in Boroondara is scarce and generally in poor ecological condition. Outside Yarra Bend Park, the only EVC that has more than 1% of the pre-European representation left in even a moderately intact ecological condition is Floodplain Wetland Complex. However, it should be understood that even small, quite degraded remnants can sometimes serve as refuges for regionally rare flora or fauna and may have other attributes that make them significant.

3.3 Plant Species

After carefully filtering out dubious and erroneous past botanical records for Boroondara, the author has compiled a database containing:

- 4,703 of the author's personal observations of plant species occurring at different locations in Boroondara. Most records include information about abundance and confidence of identification. Nearly all records of

weed species are also accompanied by a rating of the associated ecological threat at the location where the observation was made;

- 1,649 similar records to the above by various other botanists, obtained from the Department of Sustainability & Environment's Flora Information System. Some of these records are duplicates and the author has flagged some as being possibly unreliable;
- 550 records of plant species transcribed from printed reports (particularly about Yarra Bend Park and Willsmere Park) and credible verbal reports;
- 133 records of pressed or pickled plant specimens collected by the author during the fieldwork; and
- 59 records of plant specimens at the National Herbarium of Victoria that represented the only, or most recent, records of their species at the site where they were collected. The author filtered these from 1,465 of the herbarium's database records for Boroondara and neighbouring areas, after carefully examining each record and sometimes inspecting the associated pressed specimens in the herbarium's collection.

Note that the fieldwork for this study has increased the number of reliable botanical records for Boroondara by a factor of between three and four.

This database has allowed the compilation of an inventory of Boroondara's indigenous flora, containing:

- 12 species of fern;
- 340 indigenous taxa (species, subspecies, varieties and hybrids) of flowering plants;
- 21 species of moss; and
- 5 species of liverwort.

These are tabulated in Appendix B, which shows how recently each species has been seen in Boroondara and in how many sites. Most species were seen by the author. Of the remainder, most are confined in Boroondara to Yarra Bend Park and have been confirmed by Cam Beardsell (backed by his experience in preparing the Yarra Bend Park flora report in 2003).

The table in Appendix B also shows the conservation status of each species at three spatial scales – Victoria, greater Melbourne and Boroondara – as determined according to Section 2.5.

Compared with previous flora inventories for Boroondara, Appendix B has many new inclusions and many deletions.

Ferns and Flowering Plants

Twenty-eight species of flowering plants and one species of fern in Appendix B are presumed to have become extinct from Boroondara, and a few other species are probably extinct from Boroondara. There could be many other species – particularly orchids – that became extinct from Boroondara long ago without their existence having been documented.

There are about a dozen species of flowering plant not listed in Appendix B that the author believes are probably present in Boroondara but remain undetected.

It is therefore estimated that there are 335 indigenous taxa of ferns and flowering plants presently occurring in Boroondara.

Some species are represented by multiple subspecies or varieties. The number of distinct species in Appendix B is 343, of which 29 are presumed extinct in Boroondara. In addition, there is one named hybrid, *Eucalyptus ×studleyensis*. By comparison, there are 210 species of wild introduced plants (Section 3.3.4).

Mosses and Liverworts

The number of species of mosses and liverworts in Boroondara is much less certain than for ferns or flowering plants. The Boroondara Biodiversity Strategy (Context 2003, Appendix 3) lists twenty-nine indigenous species of mosses, but only nine appear to be valid (the remainder being mostly records from Wattle Park, outside Boroondara). Of these nine, five have not been recorded in Boroondara since the 19th century. This does not convey a meaningful impression of Boroondara's true diversity of mosses. Similarly, the two valid liverwort

records in the Boroondara Biodiversity Strategy grossly understate the true diversity of liverworts in Boroondara.

This report was not intended to investigate mosses or liverworts in any detail, but the paucity of pre-existing data prompted the author to sample about a dozen of these plants from three sites during this study's fieldwork. Moss and liverwort expert, Matthew Dell, identified the samples and took several additional samples from Beckett Park. Despite the small number of samples, they included seven moss species and four liverwort species. Six of these species had not been previously recorded in Boroondara.

If such a small survey effort can turn up so many additional species, it seems certain that there are many other species of mosses and liverworts in Boroondara that remain undetected.

Mosses, liverworts and other nonvascular plants are ecologically important, particularly for the effects of the soil crust that they form. It also appears that at least one introduced species of moss can be a serious environmental weed, based on the observation in this study that *Pseudoscleropodium purum* covers 80% of the ground in a patch of native vegetation in Markham Reserve, Ashburton. A more extensive investigation of nonvascular plants would therefore be very welcome.

3.3.1 Rare or Threatened Nationally

From a contemporary nationwide perspective, no plant species in Boroondara is listed as rare or threatened. However, Kew once supported two species that have since become listed as vulnerable under the federal *Environment Protection and Biodiversity Conservation Act 1999*.

River Swamp Wallaby-grass (*Amphibromus fluitans*) once grew in billabongs beside the Yarra River at Kew and Balwyn North, as evidenced by specimens from 1934 and 1942 at the National Herbarium of Victoria. The 1934 specimens are lectotypes, i.e. specimens that scientifically define the species, which makes them highly scientifically significant. Since those specimens were collected, most of the billabongs have been filled or drained, and the chance that River Swamp Wallaby-grass persists sixty-three years since the last record is remote. Unfortunately, floods during the present project submerged the remaining billabongs, seriously compromising any chance of finding the species if it does persist.

Clover Glycine (*Glycine latrobeana*) grew at Hyde Park, Kew in 1883 and 1885, as evidenced by specimens at the National Herbarium of Victoria. It has probably been extinct from that park and Boroondara generally for over a century.

3.3.2 Rare or Threatened State-wide

Four wild plant species or subspecies that currently exist in Boroondara are listed as threatened in Victoria, another two species are listed as rare (but not threatened) in Victoria and two are listed as likely (but not confirmed) to be rare or threatened. These species are listed in Table 3 on the next page.

All of the species in Table 3 except *Bolboschoenus fluviatilis* were seen by the author during this study. The *Bolboschoenus* has only been recorded in Yarra Bend Park, which is outside the survey area of this study. Cam Beardsell has indicated that it was still present when he last checked, in the past few years. Although all the species in the table have been seen recently in Boroondara, note that three of them are critically endangered in Boroondara and all but one other are endangered in Boroondara.

Because these species are rare or threatened at the state level, the Department of Sustainability & Environment may take an interest in monitoring their populations and taking steps to improve their security.

The taxon *Danthonia procera* was recently removed from the official list of rare or threatened plants in Victoria as a result of a taxonomic revision that lumped *Danthonia procera* with the more common *Danthonia induta* to form the new entity, *Austrodanthonia induta*. The present author regards *Danthonia procera* as distinct from *Danthonia induta* at the subspecific level or higher, which would warrant its inclusion in Table 3. Genetic analysis will probably settle this issue in due course.

Table 3. Plants of Boroondara that are Rare or Threatened in Victoria.

As described in Section 2.5.2, the highest threat rating is ‘critically endangered’, followed by ‘endangered’, then ‘vulnerable’. ‘Rare’ species are not subject to any known significant threats of extinction. ‘Data deficient’ means there is too little information to make a valid assessment of extinction risk.

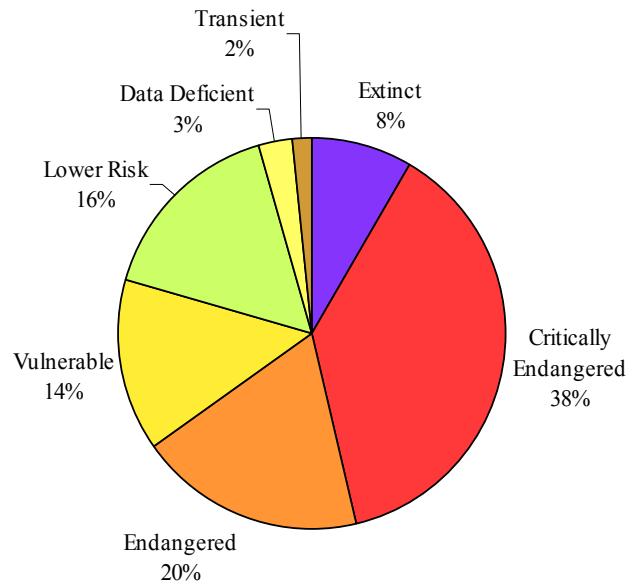
Species Name	Status in Victoria	Status in Boroondara	Comments
<i>Eucalyptus ×studleyensis</i>	Endangered	Critically endangered	A small group in Yarra Bend Park and two highly isolated individuals in Kew & Ashburton
<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	Vulnerable	Endangered	Distribution and numbers unclear
<i>Eucalyptus leucoxydon</i> ssp. <i>connata</i>	Vulnerable	Vulnerable	Known with certainty only at Yarra Bend Park, where common
<i>Geranium solanderi</i>	Vulnerable	Critically endangered	Very localised. Identity confirmed by L.P. Smith
<i>Geranium</i> sp. 3	Rare	Endangered	Very localised. Identity confirmed by L.P. Smith
<i>Nicotiana suaveolens</i>	Rare	Endangered	Approximately 200 plants in Yarra Bend Park
<i>Bolboschoenus fluviatilis</i>	Data Deficient	Critically endangered	A single patch, in Yarra Bend Park
<i>Lepidium pseudohyssopifolium</i>	Data Deficient	Endangered	Scattered widely beside the Yarra River

In addition to the contemporary records that appear in Table 3, *Diuris behrii* was collected in Boroondara in 1925 but became locally extinct long before that species became vulnerable in Victoria as a whole.

3.3.3 Rare or Threatened Locally

The conservation status (or level of threat) of each indigenous plant species in Boroondara has been assessed according to the international Red List criteria, as described in Section 2.5.2. Each species’ conservation status is included in the table in Appendix B and a graphical summary is shown in Figure 2. The summary is only for ferns and flowering plants because the status of mosses, liverworts and other nonvascular flora is poorly known. Figure 2 is derived from the numbers of taxa (species, subspecies, varieties and one named hybrid) in each category of conservation status, but there is negligible difference if only whole species are considered.

Figure 2. Summary of the municipal-scale conservation status of Boroondara’s inventory of 352 indigenous taxa of ferns and flowering plants.



To aid interpretation of Figure 2, recall from Section 2.5.2 that in simplified terms, any species that has at least a one-in-ten likelihood of becoming extinct from Boroondara within 100 years qualifies as at least Vulnerable under the Red List criteria. The category rises to Endangered if (but not only if) there is at least a one-in-five likelihood of extinction within a period of twenty years or five generations of the species (whichever is longer, up to 100 years). The category rises to Critically Endangered if (but not only if) the likelihood of extinction rises to 50% within ten years or three generations (whichever is longer, up to 100 years). The 'data deficient' category is for species that are inadequately studied to assess their risk of local extinction.

A lot can happen to species and communities in 100 years, as evidenced by the past century, so the large proportion of threatened species in Figure 2 is perhaps not too surprising.

Figure 2 leads to some very important conclusions:

- A huge proportion of Boroondara's indigenous ferns and flowering plants are threatened with extinction in the municipality – 79% of all the species that are not already extinct.
- 132 species are critically endangered in Boroondara, representing 38% of all indigenous species of ferns and flowering plants that occur in Boroondara today. Most of these 132 species have fewer than fifty mature individuals and receive no immigration from elsewhere. These species are mostly in grave peril, at least in the wild.
- Boroondara faces massive loss of plant species in the coming couple of decades, unless preventative measures are taken.

Conservation of native flora in Boroondara is at a critical stage. It is still realistic to aim to maintain the existence of every indigenous plant species presently in the municipality, but it appears that more than quarter (and perhaps as much as half) of these species could be lost within two or three decades if no preventative action is taken.

Until now, extremely few plant species have been targeted with specific actions to prevent them becoming extinct in Boroondara, and most such efforts have been in Yarra Bend Park. This will have to change if the predicted local extinctions are to be prevented or ameliorated. Some recommendations for establishing a program of protective measures and recovery actions are given in Section 4.3. Recommendations concerning particular sites are given in the relevant sections of Chapter 5.

3.3.4 Environmental Weeds

A table of 210 naturalised plant species found in remnant vegetation during this study appears in Appendix D. 'Naturalised' means that they have been introduced and now reproduce and persist without deliberate human assistance. The term 'environmental weed' applies to a naturalised plant that has a significant adverse effect on indigenous flora or fauna.

Appendix D includes a rating of the environmental threat or impact of each naturalised plant species in Boroondara, using the scale of 'Very serious', 'serious', 'Moderate' and 'Insignificant', as described in Section 2.3.3.

Six plant species were rated as causing a very serious environmental threat or impact to at least one site. However, one of these species was rated as very serious in only two sites, and the other five species were rated as very serious in only one site each. Because of these small numbers of sites, all six species were rated as serious (rather than very serious) weeds when considered from the perspective of the whole municipality.

Overall, thirty-three plant species were rated as serious weeds from the perspective of the whole municipality, and they are listed in Table 4. Another 109 species were rated as moderate threat and 67 were rated as insignificant. Note that the severity of a weed's effects is only one of several factors that should influence the priority put on its control, including the ease and cost of control and the likely rate of re-infestation. A weed may be a high priority for control at one site and a low priority at another site.

Table 4. Environmental weed species rated as ‘serious’ from a Boroondara-wide perspective, also showing the number of sites in which each species was found during this study. Species regulated under the *Catchment and Land Protection Act 1994* are underlined.

Scientific Name	Common Name	No. of Sites
<i>Acer negundo</i>	Box Elder	10
<u><i>Allium triquetrum</i></u>	Angled Onion	12
<u><i>Alternanthera philoxeroides</i></u>	Alligator Weed	1
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass	11
<i>Araujia sericifera</i>	White Bladder-flower	8
<i>Briza maxima</i>	Large Quaking-grass	8
<i>Bromus diandrus</i>	Great Brome	8
<i>Cotoneaster pannosus</i>	Cotoneaster	6
<u><i>Crataegus monogyna</i></u>	Hawthorn	12
<i>Cynodon dactylon</i>	Couch	19
<i>Dactylis glomerata</i>	Cocksfoot	20
<i>Delairea odorata</i>	Cape Ivy	7
<i>Ehrharta erecta</i>	Panic Veldt-grass	32
<i>Ehrharta longiflora</i>	Annual Veldt-grass	13
<u><i>Foeniculum vulgare</i></u>	Fennel	19
<i>Fraxinus angustifolia</i>	Desert Ash	21
<i>Galium aparine</i>	Cleavers	23
<u><i>Genista monspessulana</i></u>	Montpellier Broom	8
<i>Hedera helix</i>	Ivy	13
<i>Ligustrum lucidum</i>	Large-leafed Privet	11
<i>Oxalis pes-caprae</i>	Soursob	5
<i>Paspalum distichum</i>	Water Couch	9
<i>Pennisetum clandestinum</i>	Kikuyu	19
<i>Pittosporum undulatum</i>	Sweet Pittosporum	20
<i>Ranunculus repens</i>	Creeping Buttercup	10
<u><i>Rubus anglocandicans</i></u> = <i>R. discolor</i>	Blackberry	21
<i>Salix fragilis</i> group	Crack Willows	5
<i>Salix babylonica</i>	Weeping Willow	7
<i>Salpichroa organifolia</i>	Pampas Lily-of-the-Valley	10
<i>Solanum mauritianum</i>	Tobacco-bush	7
<i>Tradescantia fluminensis</i>	Wandering Jew	20
<u><i>Ulex europaeus</i></u>	Gorse (Furze)	14
<i>Vinca major</i>	Blue Periwinkle	7
<i>Vulpia bromoides</i>	Squirrel-tail Fescue	12

Environmental weeds are a major cause of loss of indigenous flora and fauna species. This was well recognised in Boroondara at least 120 years ago, when Reader (1885) wrote of Studley Park, ‘*The greater number of these [65 weed species] have thoroughly established themselves, and in some instances the hardier kinds have replaced the weaker native species*’.

The main effect of environmental weeds in Boroondara was observed in this study to be out-competition of indigenous flora and consequent loss of native vegetation communities. The secondary effect is loss of indigenous fauna that rely on the native vegetation, but so much native vegetation has already been lost that most of the remaining fauna species are necessarily species that have adapted to cope with weedy or exotic vegetation. Indeed, indiscriminate removal of woody weeds in the more natural areas of Boroondara runs the risk of destroying what little habitat is left.

Some weeds cause direct harm to indigenous fauna, e.g. due to toxicity when eaten. An interesting example is the White Bladder-flower (*Araujia sericifera*) from South America, also called Cruel Vine because of the way

its flowers capture and kill moths and butterflies (Figure 3). This weed species is abundant on the Yarra River floodplain.



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Figure 3. A Yellow-banded Dart with its proboscis caught in a clip-like trap at the base of a flower of the White Bladder-flower (*Araujia sericifera*).

3.4 Large Old Trees

As discussed in Section 2.3.5, the Department of Sustainability & Environment's habitat score method provides points for the presence of large old trees. Because of the types of vegetation in Boroondara, large old trees are generally those whose trunk diameter (measured 1.3 metres above ground level) is at least 0.8 metres, equivalent to a girth of 2.51 metres.

Trees of such a size are very old, but quantifying this is difficult. Even for a single species, growth rates of trees vary between seasons, sites and life stage, as demonstrated in the case of River Red Gums by Argent (1995). His subject trees were of known ages up to 75 years, and their trunk diameters grew at rates of typically 2-9mm per year, averaged over their life. This would give an age of 90-400 years for a River Red Gum with a trunk diameter of 0.8m.

The present author counted annual rings of a felled River Red Gum approximately sixty years old, growing in relatively harsh conditions on the Yarra River escarpment near Victoria Bridge in Kew. For the parts of the stump where growth rings were discernible, the trunk diameter growth rate was 2.6mm/year. If this is typical at all life stages, a River Red Gum with a trunk diameter of 0.8m would be over 300 years old.

Another indication of the extreme ages of large trees can be found at the Boroondara General Cemetery in Kew, where five River Red Gums volunteered themselves on graves dug in various parts of the cemetery in 1884-1908. The largest trunk diameter of these trees today is 0.64 metres, at an apparent age of approximately 120 years. Extrapolating, the corresponding age of a River Red Gum with a trunk diameter of 0.8m would be 160 years. This is approximately half the value inferred from the stump on the Yarra escarpment, the difference being attributable to better growing conditions.

Even in very good growing conditions, River Red Gums that formally qualify as large old trees must be well over a century old. This is evidenced by a River Red Gum beside the Yarra River in the Kew Golf Club property, depicted in Figure 4 on the next page. This tree is listed by the National Trust because it was used by Robert Hoddle in 1844 to mark a land boundary in the first land sale in Melbourne. It must have stood out as a landmark tree at that time, 161 years ago. Its present trunk diameter is 1.0 metres, not greatly different from the threshold of 0.8 metres for a large old tree.

Figure 4. The Hoddle tree at Kew Golf Club.



It is clear that large old River Red Gums are typically centuries old and cannot be replaced in a human time span. They are usually also visually impressive, and they should be given every chance to survive and flourish.

These considerations make it important not to prematurely condemn large trees when they appear in poor condition or health. With proper care (which often includes watering), unhealthy trees can often recover. The evidence given above that large River Red Gums are extremely old reinforces the importance of giving them every possible assistance to survive and flourish.

It would be reasonable to extrapolate these comments to large remnant eucalypts other than River Red Gums.

A total of 246 large old trees were assessed during the present survey using the procedures discussed in Section 2.3.5. Table 5 indicates the spread of health ratings that were given to these trees.

Table 5. Qualitative health ratings from assessment of large old trees.

Health rating:	Very good	Good	Fair to good	Fair	Fair to poor	Poor
Number of Red Gums:	45	122	13	26	0	4
Number of other species:	10	18	1	4	1	0

3.5 Fauna

A database of 7,809 observations of fauna species has been compiled, of which 1,268 observations were recorded during the fieldwork for this study.

Appendix E provides a list of fauna that have been reliably recorded in Boroondara, and summary statistics for the current-day fauna are given in Table 6.

Table 6. Summary statistics of Boroondara's current-day fauna.

Fauna Group	Number of Native Species	Number of Species Threatened in Vic.	Number of Species Threatened in Boroondara	Number of Introduced Species
Butterflies	19	0	uncertain	1
Fishes	12	2	9	14
Frogs	8	0	7	1
Reptiles	15	1	13	1
Mammals	14	1	4	6
Birds	153	10	33	13

As mentioned in connection with plants in Section 3.3.3, the reader should have a basic understanding of what qualifies as ‘threatened’. In simplified terms, any species that has at least a one-in-ten likelihood of becoming extinct from the area in question (Victoria or Boroondara, in this case) within 100 years from now qualifies as at least Vulnerable under the Red List criteria. The category rises to Endangered if (but not only if) there is at least a one-in-five likelihood of extinction within a period of twenty years or five generations of the species (whichever is longer, up to 100 years). The category rises to Critically Endangered if (but not only if) the likelihood of extinction rises to 50% within ten years or three generations (whichever is longer, up to 100 years).

3.5.1 Birds

This study found 170 bird species (157 native and 13 introduced) to be reliably recorded in Boroondara. These are tabulated in Appendix E (at page 479) along with their conservation status. Four species are believed to be extinct from Boroondara. Two of the remaining species are listed under the *Environment Protection & Biodiversity Conservation Act 1999* (EPBC) as endangered: the Swift Parrot (*Lathamus discolor*) and the Regent Honeyeater (*Xanthomyza phrygia*), both of which are occasional visitors to Boroondara (not every year).

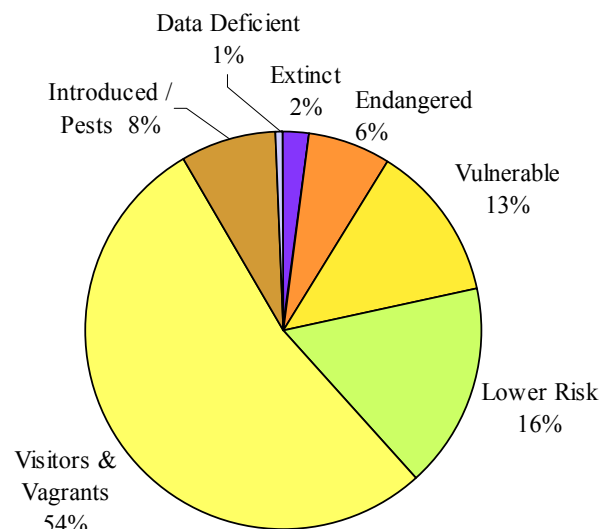
At the state level, two of Boroondara’s current-day bird species are listed as critically endangered, two are listed as endangered, six are listed as vulnerable and six are listed as ‘near threatened’. All but two of these species (both listed as ‘near threatened’) are rare visitors or vagrants. One of the exceptions is the Nankeen Night Heron (*Nycticorax caledonicus*), which is resident and breeds in substantial numbers on the Yarra River floodplain. The other exception is the summer migrant, Azure Kingfisher (*Ceyx azurea*), which is recorded in very small numbers along the Yarra River ecological corridor, about every second year.

Thirty-seven native birds recorded in Boroondara are considered rare or threatened in greater Melbourne by Beardsell (1997). Note that some species have become much less rare in greater Melbourne since 1997, which explains how a species such as the Crested Pigeon can be listed in Appendix E as rare or threatened in greater Melbourne but secure in Boroondara. Eleven of the species regarded by Beardsell as rare or threatened in greater Melbourne are rare visitors or vagrants to Boroondara; twenty-three are occasional visitors, two are residents and one is locally extinct. The residents are the Darter (*Anhinga melanogaster*) and Crested Pigeon (*Ocyphaps lophotes*).

Figure 5 summarises the conservation status within Boroondara of all bird species recorded in the municipality.

Figure 5. Summary of the municipal-scale conservation status of Boroondara’s 170 bird species.

‘Visitors’ includes indigenous species that make only minor use of habitat in Boroondara, usually not every year, and whose appearance in Boroondara can be regarded as a spill-over from habitat adjoining the municipality.



The records of summer migrant species within Boroondara include some very recent sightings such as the Horsfield's Bronze-Cuckoo (*Chrysococcyx basalis*), Rufous Fantail (*Rhipidura rufifrons*) and Rufous Whistler (*Pachycephala rufiventris*). Some migrants have not been recorded for some time, e.g. the Brush Cuckoo (*Cuculus variolosus*) was last recorded in 1976. Other species recorded include migratory vagrants such as the Common Koel (*Eudynamis scolopacea*), and with some other species it is not possible to determine if the records were of vagrants or aviary escapees (e.g. Peaceful Dove *Geopelia striata*).

Habitat

The Yarra River and associated billabongs support a healthy diversity and number of wetland bird species. A few examples of species normally restricted to lakes greater than 8 ha or large rivers have been recorded, such as the Great Crested Grebe (*Podiceps cristatus*) and the Black Swan (*Cygnus atratus*), but some other such species otherwise found in the greater Melbourne area appear absent, such as the Australasian Shoveler (*Anas rhynchos*). The billabongs and lakes support breeding populations of various species such as the Australian Darter (*Anhinga melanogaster*), which is uncommon in the region.

The importance of the ecological corridor of the Yarra River was confirmed by the directions of flight of many birds observed during this study, including several cormorant species, two heron species, various summer migrants such as the Rufous Whistler (*Pachycephala rufiventris*), and large woodland species such as the Yellow-tailed Black Cockatoo (*Calyptorhynchus funereus*). The Yarra River corridor also explains the presence of two kingfisher species – the Azure Kingfisher (*Alcedo azurea*) and Sacred Kingfisher (*Todiramphus sanctus*).

Movement of cormorants, herons and Red-rumped Parrots (*Psephotus haematonotus*) was also observed along Koonung Creek, which meets the Yarra corridor at Freeway Golf Course (Site 4 in Chapter 5).

The brief presence in Boroondara of four regionally rare honeyeater species (the Fuscous (*Lichenostomus fuscus*), Yellow-tufted (*Lichenostomus melanops*), Tawny-crowned (*Phylidonyris melanops*) and Spiny-cheeked (*Acanthagenys rufogularis*)) in 1983 is explicable by the severe drought at the time, and a surprising influx of these species occurred more generally in the Melbourne area during this period.

The Brown-headed Honeyeater (*Melithreptus brevirostris*), White-naped Honeyeater (*Melithreptus lunatus*) and Satin Flycatcher (*Myiagra cyanoleuca*) were last observed between 1986 and 1991. The absence of more recent records reflects the lack of reasonably sized (greater than 50 ha), non-linear, high quality Plains Grassy Woodland and Valley Grassy Forest habitat and the lack of connectivity to large habitat areas found further away from central Melbourne such as in the City of Manningham. This would also account for the absence of the White-throated Treecreeper (*Cormobates leucophaea*) from the list for Boroondara.

Expanses of open areas with scattered trees and shrubs such as golf courses and some parkland support species such as the Crested Pigeon (*Ocyphaps lophotes*), Red-rumped Parrot (*Psephotus haematonotus*) and various raptors. Crested Pigeons have recently established themselves in abundance across the eastern side of Melbourne since the 1980s and were observed during the survey period. The Brown Goshawk (*Accipiter fasciatus*) and Australian Hobby (*Falco longipennis*) are common species of raptor occurring in Boroondara, while the Little Eagle (*Hieraaetus morphnoides*) and Whistling Kite (*Haliastur sphenurus*) appear as rare visitors.

Eucalypts scattered widely across Boroondara are sufficient to account for a sighting of the Gang-gang Cockatoo (*Callocephalon fimbriatum*) during the survey period and indeed the proliferation of the Rainbow Lorikeet (*Trichoglossus haematodus*), Red Wattlebird (*Anthochaera carunculata*) and Noisy Miner (*Manorina melanocephala*). Throughout much of the greater Melbourne area, the planting of a diversity of non-indigenous eucalypts with a range of flowering times has enabled Rainbow Lorikeets (and to a lesser degree other lorikeet species) to rapidly expand in numbers since the 1970s. The presence of such scattered eucalypts and various shrubs (e.g. in golf courses, small council plantings or domestic gardens) have favoured the presence of the aggressive Red Wattlebird and Noisy Miner. These bird species also utilise nectar provided by plantings of non-indigenous native shrubs such as various Callistemons. As a consequence of the aggressiveness of these species and the paucity of broadacre woodland available, there is limited opportunity for a diversity of smaller species to persist in reasonable numbers, either insectivorous or nectar-feeding. The Eastern Spinebill (*Acanthorhynchus tenuirostris*) is one smaller species that has survived this situation, perhaps due to its deft flying ability and its ability to feed upon small flowering shrubs that are not favoured by the Red Wattlebird or Noisy Miner.

The Noisy Miner and Red Wattlebird are often less dominant in the Red Gum habitat along streams, where there is an abundance of the prickly shrubs, Tree Violet (*Melicytus dentatus*) and Prickly Currant Bush (*Coprosma quadrifida*). This allows some smaller species to persist, including the White-plumed Honeyeater (*Lichenostomus penicillatus*), Eastern Yellow Robin (*Eopsaltria australis*) and White-browed Scrub-wren (*Sericornis frontalis*). The last of these species, along with the Brown Thornbill (*Acanthiza pusilla*), also persist in secluded gardens, even in the absence of native vegetation.

The small Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*), a ground-feeding species occurring in small flocks, is found in Boroondara in larger areas of open parkland that receive less use by humans.

The records of owl species such as the Boobook Owl (*Ninox novaeseelandiae*) reflect the presence of large hollows within Boroondara. However, the number of hollows observed in this study was rather low, which limits the opportunities for persistence and breeding of owls and other hollow-dependent species (e.g. Red-rumped Parrot and Striated Pardalote (*Pardalotus striatus*)).

Trends

Some major unexpected trends and shifts in bird populations and behaviour have appeared in the past fifteen years. Perhaps the most important is the dramatic proliferation and spread of the Noisy Miner. This species had not been recorded in Kew until the early 1990s but has now become perhaps the most common bird species there, displacing many others with its aggressive behaviour. The Rainbow Lorikeet has been proliferating and spreading in a similar way and over a similar period to the Noisy Miner, after having been displaced from the Melbourne area altogether for well over a century.

Other species that were absent from Melbourne suburbs for very long periods and which have recently established rapidly growing populations in Boroondara include the Long-billed Corella, Yellow-tailed Black-Cockatoo and Crested Pigeon. The Little Corella may be starting to do the same, extrapolating from its rate of spread westward from the Upper Yarra Valley. The Brown Thornbill has not been absent from Boroondara but it appears to be increasing in abundance.

Climate change may be expected to produce other significant changes in Boroondara's bird fauna in coming decades.

Further Investigation

Birds are the most easily studied group of fauna and have received the greatest degree of investigation in Boroondara, during and prior to the present study. There is adequate baseline data to allow the detection of any significant future trends in bird populations.

Within five to ten years, it would be prudent to review the status of bird populations in Boroondara in a way similar to the present study, and with similar thoroughness (although validation of records up to mid-2005 need not be repeated).

3.5.2 Mammals

This study found twenty-four species of mammal to be reliably recorded in Boroondara, as tabulated on page 478 in Appendix E. Seventeen species are native and seven are introduced pests.

The Eastern Quoll and both species of bandicoot (Southern Brown and Eastern Barred) have been extinct in Boroondara for more than fifty years, with no hope of return in the foreseeable future. Of the fourteen other indigenous mammal species in the list, the only one listed as threatened nationally or in Victoria is the Grey-headed Flying-fox (*Pteropus poliocephalus*). Although this species is listed as vulnerable nationally and in Victoria, it is commonly seen all around Melbourne's suburbs, particularly in domestic and public gardens. An 8,000-strong colony of Grey-headed Flying-foxes roosts on the banks of the Yarra River in Yarra Bend Park.

Among the other mammals found in Boroondara, the only one that is uncommon in greater Melbourne is the Platypus, which Beardsell (1997) regarded as 'regionally depleted'. Platypus are found along the Yarra River anywhere upstream from Yarra Bend Park, but it is their habit to be rather widely spaced and so there are few enough of them in Boroondara to qualify as endangered in the municipality. The native Water Rat or Rakali is

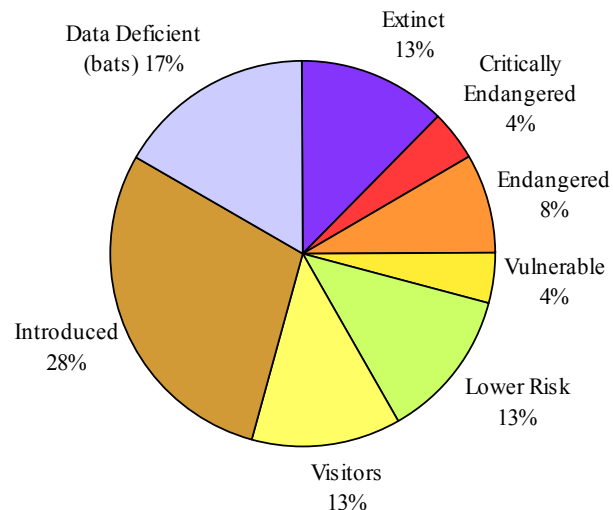
also scattered along the Yarra River as well as Gardiners Creek, in small enough numbers to qualify as endangered.

The only species of mammal that is definitely resident and critically endangered in Boroondara is the Echidna. An extremely small number persist in Yarra Bend Park, where they are at risk from being killed while crossing Yarra Boulevard (amongst other things). The same is true of the Black Wallaby (or possibly wallabies) that has been spotted from time to time for two years, between Yarra Bend Park and Willsmere Park in Kew East. If the Black Wallaby were to be deemed resident, it would qualify as critically endangered in Boroondara.

Figure 6 summarises the conservation status within Boroondara of all mammal species recorded there.

Figure 6. Summary of the municipal-scale conservation status of Boroondara's 24 mammal species.

'Visitors' includes rare visitors and vagrants, such as the Eastern Grey Kangaroo.



All but one of the introduced mammal species are pests that have a significant adverse impact on indigenous flora or fauna. The Red Fox presents probably the greatest environmental threat (e.g. killing Platypus and waterbirds), and the Black Rat and House Mouse are probably also serious. However the impact of these species could not be well determined in this study.

Further Investigation

Insectivorous bats in Boroondara have not been adequately surveyed to form a clear view about their status. Recent trap-and-release studies just to the north of Boroondara suggest that the species listed in Appendix E may be incomplete. A survey of locations along the Yarra River would be desirable. The species whose conservation status can be best estimated is the only one that is audible to humans, the White-striped Freetail Bat (*Nyctinomus australis* = *Tadarida australis*). The present author is concerned that he has heard far fewer individuals in recent years than a decade ago, providing added impetus for a survey to determine whether there are any trends in numbers of insectivorous bats.

3.5.3 Frogs

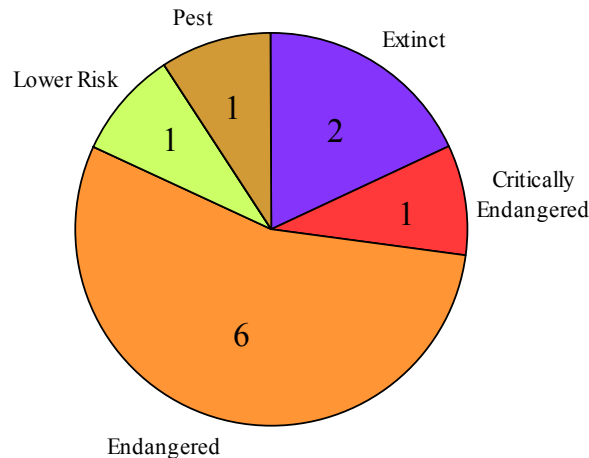
Eleven species of frog were found to be reliably recorded in Boroondara, as tabulated on page 477 in Appendix E. Two of these species, the Southern Toadlet (*Pseudophryne semimarmorata*) and the Warty Bell Frog (*Litoria raniformis*, also called the Growling Grass Frog), are believed to be extinct from Boroondara, having disappeared for well over a decade from their last known habitat. Both these species are listed as threatened in Victoria, and the Warty Bell Frog is listed as vulnerable nationally.

No other frog species in Appendix E is listed as rare or threatened in the whole of Victoria, but Peron's Tree Frog (*Litoria peronii*) is vulnerable in the greater Melbourne region (Beardsell 1997). It was last seen in

Boroondara in 1998 and is now rated as critically endangered in the municipality. There is a reasonable chance that it is still present near the Yarra River at a site such as the Freeway Golf Course or Willsmere Park.

The precarious state of Boroondara's frog species is summarised in Figure 7, with only one indigenous species rated as secure (the Common Froglet, *Crinia signifera*). This is perhaps not surprising, given that there has been a drastic decline in frog species globally and particularly in Australia.

Figure 7. Summary of the municipal-scale conservation status of Boroondara's eleven frog species.
Numbers within the slices of the pie represent numbers of species.



An unusual feature of Boroondara's frog fauna is that one species has become a pest – the Eastern Dwarf Tree Frog, *Litoria fallax*, from New South Wales and Queensland. It has established in large numbers at the main pond at Hays Paddock in Kew East, and the author suspects that it is responsible for the unexpected paucity of the Southern Brown Tree Frog (*Litoria ewingii*) at that pond. It may have been deliberately released there, or escaped from a box of produce from interstate. There appears to be no documented method for eradicating such a population without detriment to indigenous frogs or other significant parts of the local environment.

Further Investigation

Surveys of frogs in Boroondara have been too irregular and at too few sites to provide a reliable indication of population sizes or trends. In particular, approximately one dozen billabongs that appear to provide excellent frog habitat on the Yarra River floodplain have not been inspected during peak breeding season for many years (or in most cases, ever). These billabongs are in Sites 4 to 8 in Chapter 5. A few of them were surveyed by Ewen McGilp in the period June to September 1994, but there are only three other frog lists (none of them complete) from any of these billabongs prior to the present study. In addition, the present study's schedule did not allow many of these billabongs to be inspected during a good time of year.

One way of improving the coverage of frog surveys at these sites may be to seek volunteers through the Melbourne Water Frog Census.

3.5.4 Reptiles

Nineteen species of reptile were found to be reliably recorded in Boroondara, as tabulated on page 478 in Appendix E. Two of these species, the Eastern Three-lined Skink (*Bassiana duperreyi*) and Little Whip Snake (*Suta flagellum*), are only included on the basis of pioneers' reports. Another species, Cunningham's Skink (*Egernia cunninghami*), has not been seen in Boroondara since 1988 and appears to have become locally extinct.

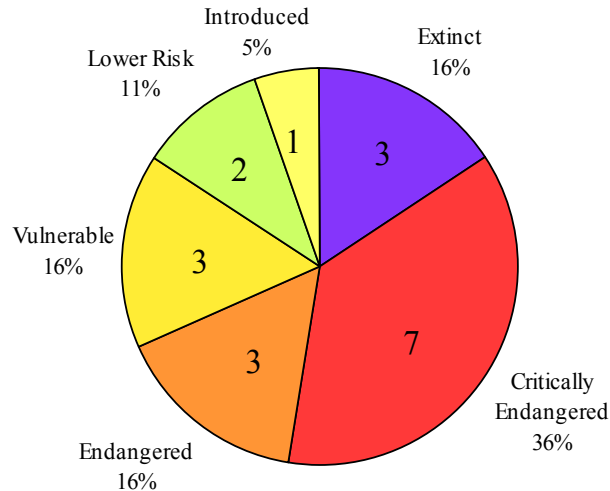
None of the reptile species in Appendix E is listed as threatened in Victoria, but one species, the Glossy Grass Skink (*Pseudemoia rawlinsoni*), is listed as 'near threatened' in Victoria. The Glossy Grass Skink is vulnerable in greater Melbourne (Beardsell 1997), and critically endangered in Boroondara because it has only been found

in a single, small patch of habitat (at Freeway Golf Course, Site 4 in Chapter 5). It has not been seen there since 1991, but the habitat is still there and an active search for the species would be desirable.

A summary of the conservation status of reptile species in Boroondara from a municipal perspective appears in Figure 8.

Figure 8. Summary of the municipal-scale conservation status of Boroondara's nineteen reptile species.

Numbers within the slices of the pie represent numbers of species.



The only non-indigenous reptile that has naturalised in Boroondara is the Gippsland Water Dragon (*Physignathus lesueurii howittii*), which has established itself on the Yarra River in and near Yarra Bend Park. It does not compete with any indigenous reptiles but its diet of aquatic fauna and plant material brings it into partial competition with the Platypus and Water Rat. It probably has an insignificant effect on the aquatic environment compared with introduced fish and numerous human influences on the river, such as pollution.

Further Investigation

Reptiles have not been well surveyed in Boroondara outside Yarra Bend Park, particularly in recent years. The present study was not able to help much in this respect because most reptile species require active, targeted searching to find them. However, this study did pay attention to sites that appear to provide suitable reptile habitat and which therefore represent priority sites for future reptile surveys.

The sites most recommended for active reptile searches are (with site numbering as in Chapter 5):

- Site 4, Freeway Golf Course, Balwyn North (particularly for Glossy Grass Skink);
- Site 6, the Burke Road Billabong, Kew East;
- Site 7, Kew Golf Club, Kew East (particularly for Glossy Grass Skink);
- Site 23, Dorothy Laver Reserve, Glen Iris (near the Swamp Scrub and Glen Iris Wetlands);
- Site 26, Markham Avenue Reserve, Ashburton;
- Site 53, Beckett Park, Balwyn.

3.5.5 Fishes

Twenty-eight species of fish were found to be reliably recorded in Boroondara, as tabulated on page 477 in Appendix E. The River Blackfish (*Gadopsis marmoratus*) and Yarra Pigmy Perch (*Nannoperca obscura*) are the only species whose local extinction seems certain, but there are probably others that became extinct before their presence was recorded (e.g. the Dwarf Galaxias, *Galaxiella pusilla*).

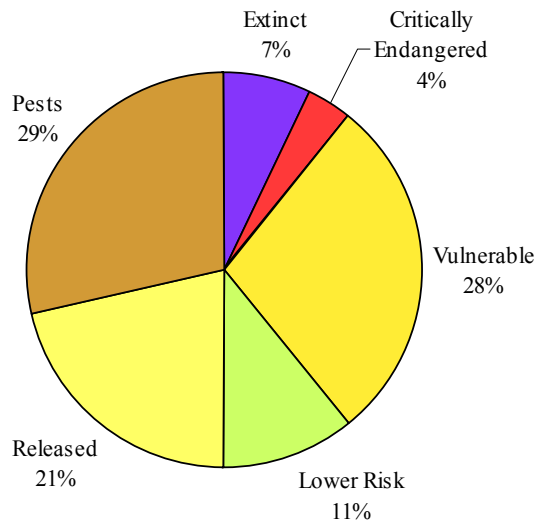
The Yarra Pigmy Perch and the Australian Grayling (*Prototroctes maraena*) are the only fish species in Boroondara that appear on lists of nationally threatened species, where they are both listed as vulnerable. The former is listed as 'near threatened' in Victoria and the latter is listed as vulnerable in Victoria (and now

Boroondara, as well). The Australian (or Tasmanian) Mudfish (*Neochanna cleaveri*) is the only other naturally occurring fish species in Boroondara that is recognised as rare or threatened at the state level. It is listed as critically endangered in Victoria, and now also in Boroondara because the only record in the municipality is a single, larval individual at Dights Falls in 1991.

A summary of the municipal-scale conservation status of fish species in Boroondara appears in Figure 9. This pie chart stands out against those for all other groups of fauna in the substantial proportion of species that are introduced, particularly those that are not deemed to be pests. Three of the non-pest species released into the Yarra River are endangered in Victoria and one is vulnerable in Victoria. They are in such small numbers that they (like the Gippsland Water Dragon discussed above) probably represent an insignificant effect on the aquatic environment compared with other influences.

Figure 9. Summary of the municipal-scale conservation status of Boroondara’s twenty-eight fish species.

The categories on the right hand side of the pie chart contain all the indigenous species. The category, ‘released’, is for species that are not indigenous to the Yarra River system but have been released there and do not appear to be causing significant harm to indigenous species.



According to fish expert, Tarmo Raadik, the Macquarie Perch is the only one of the six non-pest species released into the Yarra River system that has developed a self-sustaining population that would persist in the absence of re-stocking. The Macquarie Perch population in the Yarra River is now larger than in any stream where it occurs naturally, thereby making a major contribution to the security of this nationally endangered species.

A major ecological attribute of indigenous fishes that sets them apart from other groups of animals in Boroondara is the high proportion that must migrate to complete their lifecycle. Nine out of the twelve indigenous fish species that currently occur in Boroondara must go out to sea and return to freshwater at different life stages. Barriers to fish migration such as weirs therefore have great ecological implications, and the construction of a fish ladder at Dights Falls (at the northwestern corner of Boroondara) in 1993 has been a major improvement to the prospects of indigenous fish.

In the absence of barriers, populations of migratory fish species can build up annually through recruitment from the sea. Alternatively, populations that have vanished locally could be replenished by these recruits. Even non-migratory species could be rescued from local extinction by recruits from further up or down the Yarra River.

Because of the effectiveness of recruitment in maintaining populations of most indigenous fish species, only one fish species is either endangered or critically endangered in Boroondara.

Surprisingly, the only records of any native fish in Boroondara during 1950 to 2002 were from the Yarra River or the Yarra floodplain. This simply reflects where fish surveys were concentrated during that period and where anglers go fishing. Then, in 2002, a fish study conducted in the Gardiners Creek system (Koster 2002) detected four indigenous species: Shortfin Eel (*Anguilla australis*), Common Galaxias (*Galaxias maculatus*), Broadfin

Galaxias (*Galaxias brevipennis*), and Flatheaded Gudgeon (*Philypnodon grandiceps*). All but the last of these are migratory.

The serious pests, Carp (*Cyprinus carpio*) and Mosquitofish or Gambusia (*Gambusia holbrooki*), are both present in large numbers in Boroondara's waterways, and were seen in all possible habitats during the present study. Another pest, the Oriental Weatherloach, is also extremely common. These pests eat native aquatic fauna (including tadpoles) and Carp greatly increase the turbidity of waters, as can be seen in Gardiners Creek. Control of these species appears unlikely in the foreseeable future, but see Roberts and Tilzey (1996) about control of Carp.

Further Investigation

Freshwater scientist, Tarmo Raadik, at the Arthur Rylah Institute regards the coverage and intensity of fish surveys in Boroondara as quite low. He predicts that future surveys may detect Trout Cod, Silver Perch and Western Carp Gudgeon in the Yarra River within Boroondara. These are all species native to Victoria that do not occur naturally in the Yarra system. One might also expect additional fish species to be detected by any future survey of the Gardiners Creek system, because there appears to have been only one formal study in system to date, and it comprised only a few hours of fieldwork during a period of just eight days.

3.5.6 Invertebrates

Butterflies

Twenty species of butterfly have been definitely recorded in Boroondara, as listed in Appendix E. This list is probably incomplete.

The only butterfly species in Appendix E whose conservation status was formally determined by Sands & New (2002) for the national butterfly action plan was the Double-spotted Line-blue, *Nacaduba biocellata biocellata*. It was found to be of 'no conservation significance' at the national or state level. The other butterfly species in Appendix E were not assessed by Sands & New because they were deemed to be less likely to be threatened. Consequently, none of the butterflies found in this study is biologically significant on a scale larger than Boroondara.

There have been major human-induced changes in the distribution of butterfly species in Boroondara (as in Australia generally). Loss of critical indigenous host plants has caused some species to disappear or decline, while garden plants have allowed at least four species to extend their range into Boroondara. For example, the Orange Palm Dart (*Cephrènes augiades sperthias*) has established in Boroondara because humans have introduced palms (their larval food plants). Most of the pre-European butterfly species that persist in Boroondara have done so through adaptation to garden plants, as in the examples of Pea Blue (*Lampides boeticus*) caterpillars eating garden peas and beans, or adult Australian Admirals (*Vanessa itea*) taking nectar from ornamental flowers and Sweet Pittosporums. Conversely, species that rely on indigenous *Gahnia* sedges for their larval food are locally very scarce or extinct due to near-total removal of *Gahnia* from Boroondara.

The conservation status of butterflies within Boroondara was not determined in the present study due to paucity of data. A more detailed analysis of data from the Museum of Victoria would help to redress this. Further assistance will come from a quantitative survey of selected groups of invertebrates at Yarra Bend Park, currently being conducted by the Terrestrial Invertebrate Group of the Field Naturalists Club of Victoria. This survey has been designed to enable the development of invertebrate monitoring protocols, and assessment of environmental changes associated with human activities. The survey is funded by a Parks Victoria Volunteer Groups Grant and a grant from the Environment Fund of the Field Naturalists Club of Victoria. A substantial number of invertebrates have been collected and the process of identifying them is under way.

Other invertebrates

It should not be overlooked that although it was infeasible to investigate invertebrates for the present report, they are very important in many ecological respects, e.g. as pollinators, seed dispersers, plant parasites, food for vertebrates and major contributors to biodiversity.

A special mention should be made of one beetle species, called the Camberwell *Notonomus*. It has not been scientifically described and is known only from specimens that were collected in Camberwell and are now kept in a single collection in the USA. This is the only case known of a species of flora or fauna that has never been found living outside Boroondara. The beetle is probably extinct, but it may persist somewhere in Melbourne's eastern suburbs. The present author was mindful of this when looking for fauna during this study. The species is presumed to live under logs and litter on the ground and come out at night to hunt caterpillars and other soft-bodied insects.

Thanks to Ian Faithfull for drawing attention to the Camberwell *Notonomus*.

3.6 Sites

3.6.1 Significance Levels

Chapter 5 includes detailed documentation and maps of fifty-eight sites. The documentation of each site includes a formal assessment of the site's biological significance according to the Department of Sustainability & Environment's 'BioSites' criteria (Amos 2004). The significance ratings are summarised in Table 7.

Table 7. Summary of site significance ratings.

Significance Level	Number of Sites	Comments
National	2	The Yarra River (for threatened fish) and Yarra Bend Park (for the many Yellow Gums (<i>Eucalyptus leucoxylon</i> ssp. <i>connata</i>)).
State	13	With one exception, State significance resulted from the presence of endangered Ecological Vegetation Classes (EVCs). Nine of these sites are beside the Yarra River or on its floodplain.
Regional	2	One site has a vulnerable EVC. The other has an endangered EVC but too small and modified for State significance.
Local	28	Sites mostly significant for viable populations of locally threatened plant species; often also ecological stepping-stones for local-scale fauna movements.
'Not significant'	13	Sites with large old River Red Gums and little if any native understorey.

Note that the significance ratings are strictly confined to the sites' biological significance. The sites that rated as 'not significant' according to the BioSites criteria are nevertheless each significant for reasons of heritage, amenity or both.

With so many sites of national and state biological significance, Boroondara makes a substantial contribution to the biodiversity of Victoria, notwithstanding that many of the sites are small and substantially modified from their pre-European states. The main reason that Boroondara is of such importance is that conservation of biodiversity in Victoria, and particularly in the Gippsland Plain bioregion, relies on the contribution made by every remaining free-running stream system and almost every remaining patch of threatened EVCs. Such habitats have declined to such a small percentage of their pre-European extent that any further losses are important from a state-wide perspective.

Note that some authors in older assessments of significance deemed a site to be significant at a particular spatial scale if (and only if) the site had attributes that stood out at that scale; For example, a site of State significance had to be outstanding compared with the rest of Victoria. By contrast, the current approach is to determine whether a site is important for conserving biodiversity at a particular scale, regardless of whether it is outstanding. For example, a site supporting an endangered EVC is deemed to be of State significance even

though there may be other examples of the EVC in better ecological condition. This subject is further discussed by Amos (2004).

3.6.2 Corridors

During the fieldwork for this study, evidence was specifically sought for fauna moving along corridors or between islands of habitat. A network of such routes was postulated in the Boroondara *Biodiversity Corridors Plan* (Context Pty Ltd, 2004), and a strategy was developed for fostering additional and improved ecological linkages between habitat areas.

The present study confirmed that the Yarra River and open space along its margins represent a major ecological corridor for movement of flying, terrestrial and aquatic indigenous fauna, as well as for pollen, seeds and other propagules of indigenous plants. However, fences around private land (e.g. golf courses) represent serious barriers to movement of the Eastern Grey Kangaroo and Black Wallaby.

As explained in the *Biodiversity Corridors Plan*, many of the corridors under consideration in that document were not continuous lines of native vegetation (in the traditional sense of a 'wildlife corridor'), but routes along which flying fauna (birds, bats and insects), pollen and seeds can move through the landscape. The observations of the present study support this concept of corridors. Gardiners Creek and Back Creek have only very patchy native vegetation, interrupted by exotic vegetation and typical suburban landscapes, yet we found evidence that nomadic bird species such as the Sacred Kingfisher, Grey Fantail, Collared Sparrowhawk and Pink Robin consistently move along the valleys of both creeks. On the other hand, our observations were not able to discern any evidence of similar bird movements along the more continuously vegetated corridor along the Alamein railway line.

Such findings were unexpected and as yet not adequately explained. Perhaps the bird species habitually follow valleys, or perhaps they follow ancestral nomadic routes.

Even sites that are quite isolated from other areas of natural habitat, such as Beckett Park in Balwyn and the adjoining Maranoa Gardens, attract visits by bird species that are rarely seen in the eastern suburbs generally. It appears that some of the more ecologically sensitive birds species are prepared to traverse several kilometres of suburbia between small sites that meet some of their habitat needs.

The principle in the *Biodiversity Corridors Plan* of improving continuity of native vegetation along waterways is supported by the observations of the present study. No evidence could be found for the postulated existing corridor along the Alamein railway line and the rest of the Outer Circle Railway route (Site 31, page 302).

Although birds, and perhaps other flying fauna, may move along corridors or between islands of habitat, other fauna and flora are much less able to move across the landscape. In the case of indigenous flora, the fragmentation of habitat causes:

- 'Edge effects' such as accelerated ingress of weeds;
- Inbreeding; and
- Limited potential for natural immigration of seeds or propagules to replace species that disappear.

These threats must be countered if Boroondara's biodiversity corridors strategy is to be fully successful for flora. In particular, attention should be paid to maintaining plant populations that have enough genetically distinct individuals, within sufficient proximity (allowing for their range of pollen dispersal), to be self-sustaining.

3.6.3 Priority of Sites for Bushland Management

One of the requirements for this study was to recommend where the City of Boroondara should put its priorities for managing its bushland reserves, to maximise the benefits for biodiversity conservation. Such recommendations have to take into account:

- The biological significance of each patch of habitat;

- The level of threats faced by the habitat, or the degree to which it can maintain its values without management;
- The efficacy, practicability and cost of tasks that improve the habitat or prevent its deterioration;
- Collateral benefits for values other than for biodiversity conservation (e.g. the improved attractiveness of weed-free bushland in a conspicuous location), or conflicts that may arise with other interests (e.g. the disappointment that dog owners may feel if dogs are prevented from entering the breeding habitat of shy, rare waterbirds).

An added complexity for setting priorities among the sites is the balance that has to be made between small tasks with relatively small benefits, versus larger (and more costly) tasks that promise proportionately greater benefits.

Taking all these matters into account, it is a complex task to assign management priorities among the sites in which Council works. As a contribution to the task, Table 8 summarises, for each site, the author's main management recommendations, the expected level of benefit (ecological and collateral) and the level of resourcing involved. The sites (or in some cases, sections of sites) are ordered approximately according to the expected level of benefit relative to the amount of expenditure and effort involved (i.e. the cost efficiency). However, note that even some of the less cost-efficient tasks are nevertheless still very important to do, and some of the individual tasks for a site may be more important and cost-efficient than others.

The information and recommendations in Table 8 are intended to be applicable up to 2007 or 2008, after which time they would have to be reconsidered.

Note that the overwhelming majority of the tasks and effort are directed toward maintenance rather than capital works. This is principally because so many of Boroondara's existing natural assets are at risk of decline, and greater weight should be put on conserving what remains rather than creating habitat that is usually less important than what is being lost. However, funding sources (e.g. from federal government grants) often have a bias in the opposite direction.

Table 8. Summary of management recommendations, their benefits and costs, ordered according to cost efficiency. Dashes in the column for site significance indicate that the BioSites significance criteria of Amos (2004) are not met.

Site		Benefit Level of Actions	Cost of Actions	Main Actions Recommended
Number and Name	Significance			
4. Freeway Golf Course, Balwyn North and Bulleen	State	Very High	Medium to High	Intensive weed control beside the Yarra and around billabongs
53. Beckett Park, Balwyn	State	Very High	High	Fire; Intensive weed control; Manage small plant populations
26. Markham Reserve, Ashburton	State	Very High	High	Fire; Intensive weed control; Arboricultural care; Manage small plant populations
30. Rail reserve, Burwood Station to Alamein Station	State	Very High	High	Prevent ongoing damage; Localised weed control; Manage small plant populations; Arboricultural care
35. Hays Paddock, Kew East	State	High	Medium	Arboricultural care; Maintain and extend revegetation
31 (part). Outer Circle Linear Park – tiny remnant patch opposite The Ridge, Canterbury	Local	Medium to High	Low to medium	Woody weed control; hand weeding
33. Stradbroke Park, Kew East	Local	Low to medium	Low	Maintain revegetation; Arboricultural care
12. River Retreat Reserve, Kew	State	Low to medium	Low	Maintain revegetation

Site		Benefit Level of Actions	Cost of Actions	Main Actions Recommended
Number and Name	Significance			
21. Nettleton Park Reserve, Glen Iris	Local	Medium	Low to medium	Maintain and extend revegetation; Arboricultural care
46. Grace Park, Hawthorn	State	Medium	Low	Arboricultural care of remnant trees
57. A Bundy tree on Belmore Rd, Balwyn North	Local	Low to Medium	Low	Arboricultural care of a remnant tree
40. Willsmere Estate, Kew	Local	Low to Medium	Low	Arboricultural care of remnant trees
58. Leigh Park, Balwyn North	–	Low to Medium	Low	Arboricultural care of remnant trees
22. Eric Raven Reserve, Glen Iris	Local	High	Medium	Weed control; Manage small plant populations
1. Winfield Rd Reserve, Balwyn North	Regional	Medium	Low	Reduce mowing; Localised weed control
32. Outer Circle Linear Park at Asquith St, Kew East	Local	Medium	Low	Arboricultural care; Manage small plant populations (including localised hand weeding)
23. Dorothy Laver Reserve, Ashburton – Swamp Scrub	Local	Medium	Low	Intensive weed control; niche planting
9. Willsmere Park, Kew East	State	High	High	Intensive weed control; Arboricultural care; Manage small plant populations
6. Burke Road Billabong, Kew East	State	High	High	Weed control; Revegetation
5. Yarra Flats, Balwyn North	State	High	High	Control noxious weeds; Intensive weed control; Arboricultural care; Manage small plant populations
49. John Gardiner Reserve, Hawthorn	Regional	Medium	Medium	Intensive weed control
24. Ryburne Avenue Reserve, Ashburton	Local	Medium	Medium	Intensive weed control
10. Chandler Park, Kew	State	Medium	Medium	Localised weed control; Arboricultural care; Manage small plant populations; Revegetation
54. Maranoa Gardens, Balwyn	Local	Medium	Medium	Arboricultural care; Intensive weed control; Manage small plant populations
27. South Surrey Park, Surrey Hills	Local	Low to medium	Low to medium	Maintain revegetation; Arboricultural care; Manage small plant populations
31 (part). Outer Circle Rwy Corridor – small remnant patch fifty metres south of Riversdale Rd, Camberwell	Local	Low	Low	Remove Cotoneasters; selectively spray grass weeds
21. Nettleton Park Reserve, Glen Iris – remnant ground flora west of the playing fields	Local	Low to medium	Low to medium	Lions Club project: Exclude foot traffic; remove weeds by hand
25. Clifford Close Reserve, Ashburton	Local	Low to medium	Low to medium	Revegetation
3. Koonung Creek bank, Thompsons Rd to Bulleen Rd, Balwyn North	Local	Low	Low	Arboricultural care; Maintain and extend revegetation
2. Koonung Creek Reserve, Balwyn North	Local	Low to medium	Low to medium	Arboricultural care; Maintain revegetation
20. Burke Road South Reserve, Glen Iris	Local	Low	Low	Arboricultural care; Maintain revegetation

Site		Benefit Level of Actions	Cost of Actions	Main Actions Recommended
Number and Name	Significance			
15. Yarra Bank Reserve, Hawthorn	Local	Low	Low	Arboricultural care; Maintain revegetation
23. Dorothy Laver Reserve, Ashburton, excluding Swamp Scrub	Local	Low to medium	Low to medium	Maintain revegetation; Arboricultural care
16. Fairview Park area, Hawthorn	Local	Low to medium	Low to medium	Arboricultural care; Maintain revegetation on Yarra riverbank
29. Back Creek - Toorak Rd to Denman Av, Camberwell	Local	Low to medium	Low to medium	Maintain revegetation (principally by weed control)
19. Gardiners Creek banks, not included in other sites	Local	Low	Low	Maintain and extend revegetation
31. Frog Hollow Reserve, Camberwell	Local	Low	Low	Maintain revegetation (principally by weed control)
50. Cato Park, Hawthorn East	–	Low to Medium	Low to Medium	Arboricultural care of remnant trees
44. Kellett Reserve, Kew	–	Low to Medium	Low to Medium	Arboricultural care of remnant trees
37. Victoria Park, Kew	–	Low to Medium	Low to Medium	Arboricultural care of remnant trees
48. St James Park, Hawthorn	–	Low	Low	Arboricultural care of remnant trees
45. Hilda Crescent, Hawthorn	–	Low	Low	Arboricultural care of remnant trees
52. John August Reserve, Balwyn	–	Low	Low	Arboricultural care of remnant trees
51. Canterbury Gardens, Canterbury	–	Low	Low	Arboricultural care of remnant trees
56. Deepdene Park, Balwyn	–	Low	Low	Arboricultural care of remnant trees
14. Pridmore Park, Hawthorn	Local	Low to medium	Medium	Maintain revegetation; Arboricultural care
28. Back Creek - Riversdale Rd to Cornell St, Camberwell	Local	Low to medium	Medium	Arboricultural care; Maintain revegetation
55. Belmont Park, Canterbury	Local	Low to medium	Medium	Arboricultural care; Maintain and extend revegetation
13. Victoria Bridge escarpment, Kew and Hawthorn	Local	Low to medium	Medium	Intensive weed control; Manage small plant populations
31. Alamein Railway Corridor, Toorak Rd to Elaroo Av, Camberwell	–	Low	Low to Medium	Arboricultural care of remnant trees
31. Outer Circle Linear Park from Boroondara Park, Canterbury to High St, Kew	Local	Low	Low to medium	Maintain revegetation; Arboricultural care
31. Outer Circle Linear Park, from Alamein Station to Ryburne Avenue	Local	Low to Medium	Medium	Arboricultural care of remnant trees

4. Strategic Issues Affecting Biodiversity

This chapter contains a discussion of strategic or widespread issues affecting the conservation of biodiversity in Boroondara. Issues applicable to individual sites are discussed in Chapter 5.

4.1 Protection of Habitat in Reserves

Yarra Bend Park is clearly the most biologically significant site in Boroondara, particularly for its rich range of vegetation types and the large number of plant species that are threatened in Victoria or the Melbourne area. However, there are some Ecological Vegetation Classes and dozens of indigenous plant species that occur in other parts of Boroondara (mainly in Council parks) but not in Yarra Bend Park.

Reserves managed by Council therefore play an important role in conserving Boroondara's natural biodiversity, albeit not as significant a role as Yarra Bend Park. The documentation in Chapter 5 includes recommendations for maximising each Council park's contribution to biodiversity conservation. Sections 4.3 to 4.8 provide additional recommendations that apply to parks as a group (as well as to other sites).

Some parks with high conservation values and more complex management requirements would benefit from the preparation and implementation of detailed management plans. The plans should focus on detailed specifications about the actions required, as well as why, when and how those actions should be done. They do not need to provide any of the information that is already available in this report, and they do not need to cover matters other than vegetation management. In decreasing order of priority, the parks that would benefit from such management plans are:

- Site 26: Markham Reserve – the western section with native understorey;
- Sites 53 & 54: the Beckett Park site and the northwest corner of Maranoa Gardens;
- Site 30: The Alamein Railway corridor – Sectors A, B and O;
- Site 9: Willsmere Park;
- Site 4: Freeway Golf Course – Yarra frontage and billabongs;
- Site 10: Chandler Park – the billabong and areas with native understorey; and
- Site 5: The Yarra Flats.

Vegetation management work is already being done in these parks, and the objective of the proposed management plans is to provide improved direction, coordination and documentation for future work, as well as advice about specialised management techniques.

4.2 Protection of Habitat Outside Reserves

While the reserves discussed in Section 4.1 are paramount to the conservation of Boroondara's biodiversity, some properties other than reserves also make major contributions.

The Freeway Golf Course (Site 4, page 74), Greenacres Golf Course (Site 8, page 119) and the Kew Golf Club property (Site 7, page 107) are all biologically significant at the State level, particularly for their wetland habitats, waterbirds and plant species that are threatened locally or across Victoria. The Freeway Golf Course is managed by the City of Boroondara and the other two golf courses are privately owned and managed.

The Burke Road Billabong Site (Site 6, page 96) functions like parkland, but is actually a mixture of unreserved Crown Land, VicRoads property and private land. It is another site of State biological significance, and a prime candidate for ecological restoration. It is strongly recommended that the responsible land managers consider the medium-term future of this land, and if possible, commission a management plan to allow protection and restoration of this highly significant site.

Collectively, the Burke Road Billabong site and the three golf courses mentioned above contain the most significant wetland and riparian habitat in Boroondara, and most of Boroondara's populations of some species of flora and fauna that are threatened throughout Victoria. These sites also contain nearly half the total area of all sites of biological significance in Boroondara.

Other non-reserve sites in Boroondara make a much lower contribution to conservation of biodiversity. The next most significant non-reserve sites are the Kew High School woodland (Site 34, page 324) and a privately owned section of Yarra River escarpment abutting the northern edge of the Victoria Bridge site (Site 13, page 166). Both of these sites are of Local biological significance.

4.3 Rare or Threatened Flora and Fauna

The pie charts of the conservation status of flora and fauna species in Sections 3.3 and 3.4, and the associated discussions in those sections, paint a grim picture of mass local extinctions of species in Boroondara within the next few decades if corrective action is not taken. Most of the affected species are not threatened across Victoria, and therefore their status is not recognised in policy or regulation by the national or state governments. Corrective action will have to be taken at the local level, particularly by the City of Boroondara.

Effective action needs to recognise that the main risk factor for a species to be rated here as threatened was having a small population size with little chance of natural recruitment from outside the municipality. In the case of plants, this factor can be compensated by planting to increase the number of populations and the number of genetically distinct individuals within a population. A population, in this context, means a group of plants that can interbreed, and it is important that plantings of locally threatened species be sufficiently close together to allow exchange of pollen.

It is recommended that the City of Boroondara establish a program to build up the numbers of locally threatened plant species, including exchange of plants between similar sites to assist outbreeding. Specific species and sites for such a program are discussed in Chapter 5.

Seeds and cuttings of locally threatened species should generally not be squandered by planting the resultant plants so sparsely, or in such habitats, that they have little chance of establishing self-sustaining populations.

The main way in which fauna can be made more secure is by maintaining and improving their habitat, by countering such threats as weeds, pest animals and water pollution, and by expanding the habitat with properly designed revegetation projects. These are the topics of the following subsections (except water pollution, which is outside the scope of this study).

The other way in which threats can be abated for some fauna is by preventing dogs from disturbing shy waterbirds at wetlands, particularly breeding sites. This applies mainly to Willsmere Park (Site 9, page 128), Hays Paddock (Site 35, page 328) and, to a lesser extent, the Chandler Billabong (in Site 10, page 143). It appears that disturbance by dogs is the main reason why many significant waterbirds, such as the Nankeen Night Heron, breed in Kew Golf Club (where dogs are banned) but not in the nearby Willsmere Park or Hays Paddock. The desire of dog owners to allow their dogs to swim in, and run around, billabongs is easily understood, but there does not seem to be an adequate understanding of how harmful such practices are to the survival of rare waterbirds.

4.4 Weeds

The weeds of concern in this study are 'environmental weeds'; that is, plants which impair the biodiversity or ecological functions of natural or semi-natural habitats. They are widely regarded as one of the most serious nature conservation problems in Victoria and Australia (e.g. Carr *et al.* 1992, Alexander and Taylor 1996, National Land and Water Resources Audit 2002).

Environmental weeds represent the most serious ecological threat to native biodiversity in Boroondara as a whole, and particularly in the most biologically significant sites.

The main ways in which environmental weeds threaten natural values are that they:

- Out-compete mature indigenous plants;
- Prevent germination and establishment of indigenous plants;
- Make habitat less fit for native fauna and more fit for introduced fauna, including pests which further threaten indigenous species; and
- Alter the cycling of nutrients and organic matter.

These processes are interrelated.

Council's management of native vegetation should pay particular attention to the weeds in Table 4, also taking into account the cost and effectiveness of control. Chapter 5 indicates which weeds pose the most serious threat to each site.

4.5 Dieback

'Dieback' is a term used to describe the most obvious symptom exhibited by a tree in response to a wide range of stresses related to pests, disease or other environmental factors. In its broadest sense, the term is applied to any tree exhibiting twig and branch death starting at the branch tips and working down toward the trunk. A good discussion of the problem is given by Jones and Elliot (1986).

Dieback of naturally occurring eucalypts – mainly River Red Gums (*Eucalyptus camaldulensis*) – is widespread and serious in Boroondara. It threatens the survival of many canopy trees, which provide the ecological foundation for areas of native vegetation. Among these trees are many very large individuals that are centuries old, which have important heritage and aesthetic values.

At the moment, too many significant eucalypts are suffering for want of fairly simple corrective measures.

It appears that the incidence of dieback has reduced slightly as the drought has eased since 2003, but there are underlying causes unrelated to drought. The most common direct causes of eucalypt dieback in Boroondara are leaf skeletonisers, leaf miners and (to a lesser degree) browsing by possums. In most cases, the insect pests are out of control because of depressed numbers of small, insect-eating birds such as the Spotted Pardalote, which are commonly displaced by the aggressive Noisy Miner or Bell Miner (both native species of honeyeater). The imbalance between the insect-eaters and the aggressive honeyeaters is due to alteration of bird habitat, the most common problem being the paucity of shrubby understorey that is sufficiently broad to provide a core where the small birds can hide.

To minimise the damage being done by dieback, the most important things that can be done by Council and others responsible for the welfare of naturally occurring eucalypts are:

- Ensuring that trees do not suffer unnecessarily from drought or dry spells of weather, if irrigation is possible;
- Having an arborist periodically check the health of the more important trees, with a view to prescribing corrective actions such as lopping and mulching of tree root protection zones;
- Providing areas of native shrubs and understorey trees (particularly indigenous species) that are broad enough to obscure vision from one side of the vegetation to the other, and therefore provide cover for small native birds that control insect pests. Beds narrower than ten metres (such as the linear plantings that are so common in parks) are unlikely to fulfil this role, even if they are rather densely shrubby;
- Fitting plastic collars to the trunks of trees that are suffering from excessive browsing by possums, and making sure that possums cannot access these tree crowns from other trees without collars;
- Avoiding compaction or severance of soil within trees' root zones, and aerating the soil if it is already compacted.

4.6 Fire

Much of Boroondara's native vegetation has evolved with fire as a major trigger for regeneration. The exclusion of fire in recent decades is a significant cause of the local extinction of indigenous plant species.

In recognition of this, Council conducted an ecological burn at Markham Reserve in autumn, 2004. The fire was less successful than it could have been if it had been more intense and in spring.

It is strongly recommended that Council conduct further ecological burns, with attention to timing, preparation and achieving adequate fire intensity. Beckett Park (Site 53, page 405) is the ideal candidate for the next burn. Since 1987, Beckett Park has lost several plant species that are dependent on fire for their regeneration, and the seed they have left in the soil will be slowly deteriorating.

4.7 Pest Animals

The following pests are believed to be having a significant detrimental impact on the native fauna and flora:

The Eastern Dwarf Tree Frog is native to New South Wales and Queensland. A large population was discovered in the Hays Paddock pond in Kew East during this study, the first recorded occurrence in or near Boroondara. The species appears to be displacing indigenous frogs, and has ready access to nearby habitat to expand its range. This represents a potentially very serious threat to Boroondara's native biodiversity, being a regional stronghold for at least one indigenous frog species. **Methods to control the Eastern Dwarf Tree Frog should be sought as a matter of urgency.** This should be done in consultation with Melbourne Water and the Amphibian Research Centre.

The Mosquitofish or Gambusia is a tiny introduced fish, present in large numbers in probably all of Boroondara's habitats for native fish. It displaces many native fish species and eats the eggs of fish and frogs. It presents a serious and apparently intractable problem.

The Carp is a fairly large, introduced species found in abundance in Boroondara's still or slow-flowing waters. It can be readily seen at the surface of Gardiners Creek or some billabongs on sunny days. It extensively browses the bottom of the stream or water body, causing high turbidity and destroying habitat for indigenous aquatic plants and fauna. Carp also eat eggs of native aquatic fauna, including fish.

The Common Myna is often seen occupying tree hollows that might otherwise be available for nesting by native birds.

The Noisy Miner and Bell Miner are indigenous species that have reached very large numbers in Boroondara, even though the former species disappeared from the Melbourne area between the early years of settlement and the 1990s. The aggressiveness of these species toward smaller insect-eating birds is reducing the diversity of birds in Boroondara and leading to secondary problems such as explosions of leaf-eating insect pests. The native Rainbow Lorikeet is another indigenous bird species that disappeared from Melbourne soon after settlement, and has returned in large numbers to the exclusion of other species (particularly Rosellas). The whole phenomenon of bird species recolonising Australia's cities in recent years is very interesting and ecologically important, but very poorly understood. The Crested Pigeon, Long-billed Corella, Little Corella and Yellow-tailed Black-Cockatoo are all in the process of recolonising Melbourne, although perhaps none of these will become pests.

Foxes are voracious predators that are believed to kill many native birds in Boroondara. They are also major spreaders of seeds of serious weeds such as Blackberry, Hawthorn and Cotoneasters. They are abundant in Boroondara, particularly along the creeks.

Blackbirds disperse berry-bearing weeds such as Blackberries, Cotoneaster, Hawthorn and Sweet Pittosporum in their droppings. They are also aggressive toward some native birds, and their scratching destroys indigenous plant seedlings.

Feral Honeybees inhabit tree hollows, thus reducing the available nest sites for native birds and possums. Honeybees also compete with native bees for nectar (Douglas 1977), and harvest nectar from some species without effecting pollination (Taylor and Whelan 1988).

Rodents (mice and introduced rats) are probably present in all remnant vegetation in Boroondara, where they may eat seed of indigenous plants and thereby inhibit regeneration of the vegetation.

4.8 Revegetation

Revegetation plays an important role in encouraging indigenous flora and fauna in Boroondara by providing additional habitat and restoring corridors of vegetation. A good example of the success of revegetation in providing wildlife habitat is the persistence of a family of Superb Fairy-wrens at Dorothy Laver Reserve in Glen Iris, relying heavily on mature revegetation beside the Monash Freeway. There are increasing instances of revegetation entering second generations of plants, hopefully heading toward self-sustaining native habitats (even if they are not particularly similar to natural vegetation).

Appendix C on page 464 provides a table of indigenous plant species suitable for use in revegetation, categorised according to Ecological Vegetation Class (EVC), life form and suitability for different purposes.

It is desirable to select species for revegetation according to the EVC that once occurred on the site, or that is ecologically appropriate to the site's modified conditions of soil, hydrology and topography. It has been common in past revegetation projects in Boroondara to use species much less selectively; e.g. the widespread use of *Dodonaea viscosa* and *Myoporum* species on alluvial river flats and sandy plains, even though these species belong to rocky escarpments. Nevertheless, even ecologically misplaced species such as these have thrived through the recent protracted, severe drought.

More attention could also be paid to provenance and contamination of plant stock. For example, revegetation projects have commonly included plants that were intended to be *Leptospermum continentale*, but all of these plants that were seen by the author were actually *Leptospermum scoparium*, a species of moister, hilly country to the east of Boroondara. There are also various plants from the basalt plains, west of Melbourne, that have established at South Surrey Park as a result of contamination of tubestock plants.

Records should be kept of all revegetation planting, including species, numbers and locations.

4.9 Further Investigation

This project has greatly increased the information available about Boroondara's indigenous flora and fauna, but there will always be more things to discover and learn. Some projects where valuable discoveries are likely to be made would be:

The Glossy Grass Skink: This rare lizard species was recorded at a billabong at the Freeway Golf Course when last surveyed in 1991. There is a strong chance that it persists there and at other secluded swampy habitat where Swamp Paperbarks grow, such as at the Kew Golf Club. A survey for the Glossy Grass Skink would be very valuable.

Other reptiles and frogs: Surveys suggested on pages 37 and 38 may add substantially to our knowledge of Boroondara's fauna, but the Glossy Grass Skink proposal is the best chance for findings of major importance.

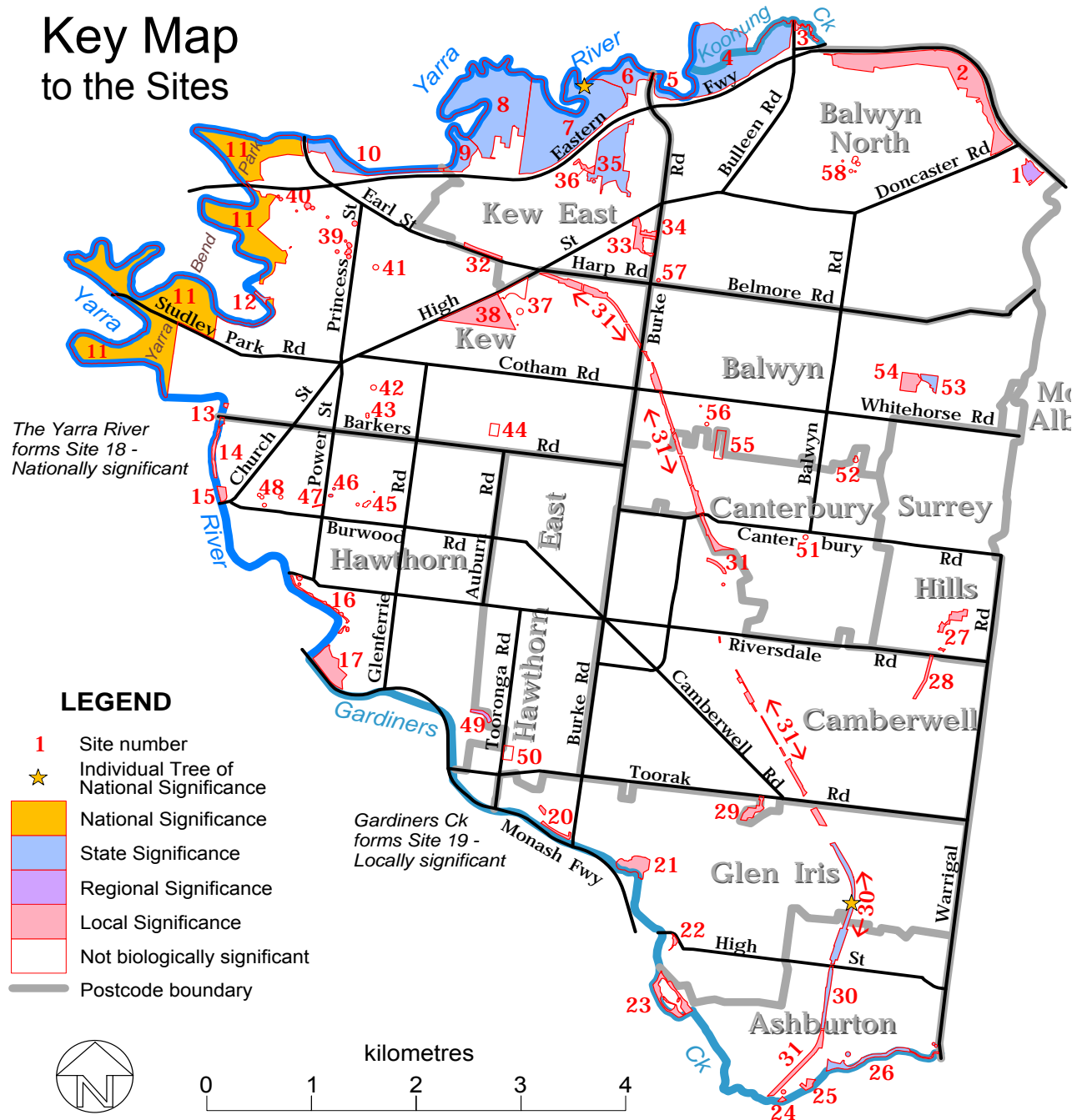
Mosses and liverworts: As indicated in Section 3.3, mosses and liverworts are an overlooked part of Boroondara's indigenous flora, and there are no doubt many species to discover. A survey of these plants would help to provide a more balanced understanding of Boroondara's biodiversity.

Insectivorous bats: There has been negligible surveying of insectivorous bats in Boroondara. Data from Ivanhoe and Bulleen, very close to Boroondara, suggests that a survey along the Yarra River in Boroondara would be very successful, with the expectation of discovering five to ten species of insectivorous bats that have not previously been recorded in the municipality.

Invertebrates: The current invertebrate project of the Field Naturalists Club of Victoria, in Yarra Bend Park, is likely to provide an indication of the groups of invertebrates to study for maximum likelihood of obtaining useful information. At the moment, the invertebrate fauna of Boroondara is very poorly known.

5. Site Assessments

This large chapter provides descriptions and significance assessments of the fifty-eight sites of biological significance included in this study. The sites are mapped in broad scale on the key map below, colour-coded according to their levels of significance (as determined by the method described in Section 2.6).



Note that the levels of significance indicated on the key map and elsewhere in this chapter take into account biological significance only, not considerations such as heritage or amenity that might be more significant. In particular, the sites that have been assessed as 'Not biologically significant' using the Department of Sustainability & Environment's criteria (Amos 2004) contain large old eucalypts that have heritage significance, high aesthetic value or both.

It should also be borne in mind that sites are never uniformly significant throughout. There are generally sections of even the world's most biologically significant sites that are used for a driveway, building or similar construction with no conservation value.

Using the Site Assessments

Documentation about any particular site of interest can be found by checking the corresponding site number on the key map on the previous page, then using the Contents at the start of the report to locate the pages where the site is documented. For convenience, site names are included on the page headers.

The documentation about each site begins with a summary of the biological significance level and a very brief summary of the site and the attributes that make it biologically significant. Most sites are illustrated by an aerial photograph overlaid with a red outline to show the site boundary and yellow lines to show property boundaries. All site boundaries have also been stored electronically for installation into the City of Boroondara Geographic Information System.

All relevant biological features of the sites are described. Habitat types are indicated according to Ecological Vegetation Classes or different types of aquatic habitat. Full lists of flora and fauna species are included for each site, except where only a handful of species has been recorded. Rare or threatened species (at the local scale or more generally) are tabulated, with an indication of population sizes, locations and sometimes threats. Each tree that meets the Department of Sustainability & Environment's criteria for a 'large old tree' has been mapped and documented, including species, trunk diameter and tree health. There is a formal assessment of each site's significance against the Department of Sustainability & Environment's 'BioSites' criteria (Amos 2004). Threats to the site's biological significance are tabulated, followed by a list of recommended actions (where appropriate). Where past data is available for monitoring ecological trends, it is compared with the corresponding data acquired in this study's fieldwork; otherwise, a new set of baseline data for monitoring is presented (including photographs, in most cases). The documentation for each site ends with a list of the sources of information that have been relied on.

Although the author has painstakingly checked the biological information and discarded unreliable data, it is impossible to filter out all faulty data without the risk of excluding some important, exceptional records of flora or fauna. It is therefore important to have regard to reliability of the sources of information (which are indicated in the text) and to give the information a commensurate weight.

Scientific and Common Names

There are so many references to plant species in this chapter that scientific names are often used without also quoting their common names. Translation between common names and scientific names can be done using Appendix B (page 455, for indigenous species) or Appendix D (page 470, for introduced species). Scientific and common names of fauna can be translated using Appendix E (page 475).

Site 1. Winfield Road Reserve, Balwyn North

A council reserve with a steep slope with moderately rich remnant ground flora. Melway ref. 46 J2.

Site Biological Significance Level: *Regional*

Summary of significant natural assets

- Approximately 4,000 m² of moderately rich ground flora belonging to the vulnerable Ecological Vegetation Class called Valley Grassy Forest, being degraded by frequent mowing;
- Viable populations of at least five locally threatened plant species, threatened by the mowing.



Scale 1:2,000

10 0 20 40 60 80 100m

Boundaries

The site is the whole of Winfield Road Reserve and its edge coincides with property boundaries, as outlined in red on the aerial photograph.

Land use & tenure: Council reserve for passive recreation and drainage.

Physical features

Site area: 2.7 hectares

Elevation: 33-48 m

Landform: Valley floor and lower slope of the southwestern side of the valley, plus freeway embankment.

Slope: Slight on the valley floor, rising rapidly to almost 1:4 on the slope to the southwest.

Soil type: The slope has thin, light grey loam topsoil with clay subsoil. The valley floor was originally covered with the alluvium of Koonung Creek, but excavation for the Eastern Freeway has resulted in most of the native soil of the valley floor being covered with clay fill.

Underlying geology: The bedrock is part of the Silurian 'Andersons Creek' formation, which comprises siltstone and sandstone. The alluvium on the valley floor was deposited in recent geological time.

Site description

As marked on the aerial photograph, this reserve includes:

- An embankment of the Eastern Freeway with young indigenous revegetation on it;
- The valley floor of Koonung Creek, which has been completely cleared and subsequently planted with exotic grass and scattered trees; and
- The southwestern slope of the valley, which retains predominantly indigenous ground flora beneath planted trees.

The site's biological significance derives principally from the 0.4 hectares of indigenous ground flora on the slope. The vegetation belongs to the vulnerable Ecological Vegetation Class, Valley Grassy Forest. This area is identifiable on the aerial photograph by the khaki green colouration on the slope. The slope was cleared of all indigenous trees and all but one shrub many years ago, but the ground flora survived. However, frequent mowing ever since has inhibited natural regeneration, particularly of woody plants.

The ecological condition of the native vegetation has been monitored in a rudimentary way as part of a VicRoads project associated with the Eastern Freeway. Between 1989 and 2002, the condition was found to have deteriorated. It appears that there has been more deterioration since then. However, there are still good prospects for recovery if the mowing is reduced in frequency and extent.

The revegetation beside the freeway promises to assist the movement of wildlife (particularly birds) along the Koonung Creek corridor, once the vegetation matures.

The trees planted elsewhere on the site are a strange conglomeration of oaks, ashes and disparate Australian natives.

Ecological links with other land

This site is on the Koonung Creek ecological corridor, which still facilitates movements of some bird species (see the section on fauna habitat below). Revegetation plots continue well upstream (southeast) into the adjacent municipalities.

Habitat type

Valley Grassy Forest (EVC 47, **vulnerable** in the Gippsland Plain bioregion)

Confined to the slope on the southwestern side of the site. Approximately 500 m² is in ecological condition C (fair) and 3,500 m² is in ecological condition D (poor). 25 indigenous plant species have been recorded.

Canopy trees: There are no remaining indigenous canopy trees.

Lower trees: There is a solitary *Acacia mearnsii*. This species is indigenous to the site and the particular specimen on the site in 2005 could be the result of natural regeneration, but there is a chance that it is planted. There are also numerous other small trees of oaks, ashes and Australian native species.

Shrubs: There are three *Bursaria spinosa* plants, one of which is uncommonly large (marked on the aerial photograph). All other indigenous shrubs have been cleared.

Vines and ferns: None.

Ground flora: Heavily suppressed by mowing, but predominantly indigenous. 40% foliage cover, with extensive bare ground. Dominated by wallaby-grasses (species of *Austrodanthonia* = *Danthonia*), *Themeda triandra* and *Microlaena stipoides*. Other abundant species are *Oxalis perennans/exilis*, *Schoenus apogon*, *Lomandra filiformis* subsp. *coriacea*, *Stipa rudis* subsp. *rudis* and *Tricoryne elatior*. The characteristic species, *Gonocarpus tetragynus* is moderately common, and another characteristic species, *Haloragis heterophylla*, was recorded in 1989 and 2002.

Habitat Score

The Valley Grassy Forest on the slope was found to have a habitat score of 20%. This could be increased to 30% by planting species that represent life forms presently absent. This, in turn, would formally raise the site's significance level to State.

Quadrat

Biosis Pty Ltd established a quadrat for VicRoads on 3/11/89 (number E10100 in the Victorian Flora Information System), for the purpose of monitoring the vegetation. It was reassessed on 24/5/02 (number E22560).

In November 1989, there were 17 indigenous species and 28 introduced species.

In May 2002, there were 10 indigenous species and 10 introduced species. The reduction is at least partly attributable to the different season of survey, but Biosis Pty Ltd concluded that the vegetation had nevertheless deteriorated.

This study recorded 23 indigenous species and 8 introduced species from the whole slope. The increased numbers of indigenous species is attributable to more detailed identification of grasses in this study, and (to a lesser degree) the larger area surveyed. There does not appear to have been a genuine increase in the number of species present.

Flora of special significance

Note from the table below that four of the fifteen significant plant species recorded from this site could not be found in 2004-5. This could be due to either the plants being mowed too low to detect, or the actual loss of the species as a result of years of mowing. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Last Record	Notes
Melbourne	Boroondara			
Rare or threatened	Critically Endangered	<i>Wahlenbergia multicaulis</i>	1989	Not found in 2004-5
	Critically Endangered	<i>Deyeuxia quadriseta</i>	2005	Dangerously few
	Critically Endangered	<i>Pentapogon quadrifidus</i>	1989	Not found in 2004-5
	Critically Endangered	<i>Haloragis heterophylla</i>	2002	One patch, 2 m × 3 m
	Critically Endangered	<i>Opercularia ?varia</i>	2005	3 plants only
	Endangered	<i>Drosera peltata</i> ssp. <i>peltata</i>	1989	Not found in 2004-5
	Endangered	<i>Hypericum gramineum</i>	2002	Not found in 2004-5
	Vulnerable	<i>Austrodanthonia eriantha</i>	2005	Numbers uncertain
	Vulnerable	<i>Austrodanthonia laevis</i>	2005	Abundant
	Vulnerable	<i>Austrodanthonia penicillata</i>	2005	
	Vulnerable	<i>Austrodanthonia pilosa</i>	2005	
	Vulnerable	<i>Austrodanthonia tenuior</i>	2005	Dangerously few
	Vulnerable	<i>Schoenus apogon</i>	2005	Abundant
	Vulnerable	<i>Amyema quandang</i>	2005	1 plant only
	Vulnerable	<i>Gonocarpus tetragynus</i>	2005	

Full flora list

The following list shows the most recent year in which each species has been recorded.

Indigenous species		<i>Opercularia ?varia</i>	2005	<i>Juncus capitatus</i>	1989
<i>Acacia mearnsii</i>	2005	<i>Oxalis perennans/exilis</i>	2005	<i>Leontodon taraxacoides</i>	1989
<i>Amyema quandang</i>	2005	<i>Pentapogon quadrifidus</i>	1989	<i>Linum trigynum</i>	2005
<i>Bursaria spinosa</i>	2005	<i>Schoenus apogon</i>	2005	<i>Oxalis purpurea</i>	1989
<i>Austrodanthonia eriantha</i>	2005	<i>Stipa rudis</i> ssp. <i>rudis</i>	2005	<i>Paspalum dilatatum</i>	2002
<i>Austrodanthonia fulva</i>	2005	<i>Themeda triandra</i>	2005	<i>Plantago coronopus</i>	1989
<i>Austrodanthonia laevis</i>	2005	<i>Tricoryne elatior</i>	2005	<i>Plantago lanceolata</i>	2005
<i>Austrodanthonia penicillata</i>	2005	<i>Wahlenbergia multicaulis</i>	1989	<i>Romulea rosea</i>	2005
<i>Austrodanthonia pilosa</i>	2005			<i>Sonchus oleraceus</i>	1989
<i>Austrodanthonia racemosa</i>	2005	Introduced species		<i>Sparaxis tricolor</i>	2002
<i>Austrodanthonia tenuior</i>	2005	<i>Agrostis capillaris</i>	2002	<i>Sporobolus indicus capensis</i>	2002
<i>Deyeuxia quadriseta</i>	2005	<i>Aira cupaniana</i>	1989	<i>Stenotaphrum secundatum</i>	2005
<i>Drosera peltata</i> ssp. <i>peltata</i>	1989	<i>Anthoxanthum odoratum</i>	2005	<i>Trifolium angustifolium</i>	1989
<i>Eragrostis brownii</i>	2005	<i>Briza minor</i>	1989	<i>Trifolium campestre</i>	1989
<i>Gonocarpus tetragynus</i>	2005	<i>Centaurium</i> sp.	2002	<i>Trifolium dubium</i>	1989
<i>Haloragis heterophylla</i>	2005	<i>Cotoneaster pannosus</i>	1989	<i>Trifolium repens</i>	1989
<i>Hypericum gramineum</i>	2002	<i>Cyperus tenellus</i>	1989	<i>Trifolium subterraneum</i>	1989
<i>Lachnagrostis filiformis</i>	2005	<i>Ehrharta erecta</i>	1989	<i>Ulex europaeus</i>	2005
<i>Lomandra filiformis coriacea</i>	2005	<i>Holcus lanatus</i>	1989	<i>Vulpia bromoides</i>	2005
<i>Microlaena stipoides</i>	2005	<i>Hypochoeris radicata</i>	2005		

The full flora data collected in the present study, including abundance data, will be stored in the Victorian Flora Information System.

Fauna of special significance

The conservation status ratings below (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Last Record
Endangered	Yellow-rumped Thornbill	1989
Vulnerable	White-striped Freetail Bat	1989
Vulnerable	Little Pied Cormorant	2005
Vulnerable	White-faced Heron	1989
Vulnerable	Eastern Rosella	2005
Vulnerable	Grey Fantail	1989
Occasional Visitor	Black-shouldered Kite	1989

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies		Birds		Magpie-lark	1989
Common Grass-blue	2005	Australian Wood Duck	1989	Grey Fantail	1989
		Little Pied Cormorant	2005	†Willie Wagtail	1989
		White-faced Heron	1989	Grey Butcherbird	2005
Mammals		Black-shouldered Kite	1989	Australian Magpie	2005
Common Ringtail Possum	2002	Masked Lapwing	1989	Little Raven	1989
White-striped Freetail Bat	1989	*Spotted Turtle-Dove	1989	*European Greenfinch	1989
*House Mouse	1989	Galah	1989	*European Goldfinch	1989
*Brown Rat	1989	Rainbow Lorikeet	2005	Welcome Swallow	1989
*Black Rat	1989	Eastern Rosella	2005	Golden-headed Cisticola	1989
		Brown Thornbill	2005	Silvereye	1989
		Yellow-rumped Thornbill	1989	*Common Blackbird	1989
		†Red Wattlebird	2005	*Common Starling	1989
		†Noisy Miner	2005		

Fauna habitat

The site provides no more habitat for native fauna than a similar area of a typical suburban park. The one Sweet Bursaria that is not being heavily and regularly mown is likely to provide some habitat for insects (including butterflies) and the planted eucalypts provide nectar for insects and birds (particularly in the case of the ironbarks).

The habitat for fauna could be greatly improved by reducing the extent and frequency of mowing.

A Little Pied Cormorant was observed flying along Koonung Creek, then across Winfield Rd Reserve to Koonung Creek Reserve (Site 2). It would then have landed at the wetlands at Koonung Creek Reserve or continued further to the Yarra River corridor. Red-rumped Parrots were also observed nearby, moving along the original course of Koonung Creek. It therefore appears that some bird species use the Koonung Creek valley as a corridor, even though the creek has been converted to a barrel drain beneath the Eastern Freeway for approximately 2 km. The role of Winfield Road Reserve in this corridor will be strengthened by the young revegetation planted beside the freeway (marked on the aerial photograph).

Site significance ratings

The following is an assessment of the site's significance against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), native vegetation belonging to a vulnerable EVC (including the Valley Grassy Forest on this site) with a habitat score of 20% has a conservation significance rating of Medium.

According to BioSites criterion 3.2.3, **Regional** significance applies to any site with a 'remnant patch' whose conservation significance is Medium due to the presence of a threatened EVC. The vegetation in question qualifies as a remnant patch because it has an adequate native understorey cover of approximately 40% and an adequate area of approximately 4,000 m².

Rare or threatened plants

The site supports viable populations of at least five species of plants that are threatened in Boroondara, representing **Local** significance according to BioSites criterion 3.1.5.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Mowing, which is presently seriously inhibiting natural regeneration and causing steady ecological deterioration.	Valley Grassy Forest; significant flora species.	High	Current
Environmental weeds, particularly grasses. The worst species were rated 'Moderate' and they belong to the following species: Sweet Vernal-grass (<i>Anthoxanthum odoratum</i>), Cat's Ear (<i>Hypochaeris radicata</i>), Ribwort (<i>Plantago lanceolata</i>), Common Onion-grass (<i>Romulea rosea</i>), Buffalo Grass (<i>Stenotaphrum secundatum</i>), Gorse (<i>Ulex europaeus</i>), Squirrel-tail Fescue (<i>Vulpia bromoides</i>).	As above	Moderate	Current

Past management and revegetation

The site has been planted with mature Australian native trees as well as indigenous revegetation beside the freeway.

Management of the slope vegetation in recent years has involved frequent mowing and occasional replacement of dead or diseased trees. The mowing has been highly negative for the significant native vegetation.

Priority actions

1. Greatly reduce the frequency and extent of mowing on the slope. Some patches with slightly richer understorey and few weeds should be completely removed from mowing. Other areas should only be mown at most a few times per year, and not as low as previously. This is a matter of high priority, considering that the vegetation belongs to a vulnerable EVC.
2. The slope vegetation should be surveyed again in spring (approximately October) after the reserve has been left unmown through the preceding six months or so, so that additional locally rare species could be detected and marked for particular care in future. This is a matter of moderate priority.
3. If these recommendations are taken and the native vegetation is allowed to regenerate, within about two years it would be wise to devise a management program that responds to the vegetation structure and composition that develops.

Future revegetation

No more revegetation plots are needed for the foreseeable future.

As trees die on the slope, they should be either not replaced, or be replaced with locally indigenous species. Care should be taken not to exacerbate the existing problem of incoherent landscape design.

If the native vegetation is allowed to regenerate, it would be desirable to plant *Billardiera scandens*, *Bossiaea prostrata*, *Clematis microphylla* and *Glycine clandestina* (unless they volunteer themselves). These species would improve the vegetation structure and the habitat score. Care should be taken not to dig out significant plants during the planting process.

If *Haloragis heterophylla* remains undetected, it should be reintroduced from propagating material found at Markham Reserve, Ashburton (or nearer, if another source is found).

The selection of any other indigenous species to be used in plantings should depend on whether the slope vegetation is allowed to regenerate. If so, species should be selected to complement the natural regeneration that is observed as well as the reserve's appearance.

Species suitable for collection of seed

There are enough of following species at this site to accommodate collection of seed for revegetation projects in the area, subject to constraints outlined in Section 4.3:

Austrodanthonia laevis, *Austrodanthonia penicillata*, *Austrodanthonia pilosa*, *Austrodanthonia racemosa*, *Aurolistia rudis*, *Eragrostis brownii*, *Themeda triandra*, *Tricoryne elatior*.

Monitoring

The data discussed above under the heading 'Quadrat', combined with the data collected in this study, indicate that the significant ground flora vegetation on the slope has been ecologically deteriorating since 1989, attributable to mowing.

If mowing is to be reduced and the significant vegetation allowed to recover, the quadrat should be reassessed at intervals of several years. It is not known whether VicRoads has any intention of continuing its past monitoring.

To assist monitoring the populations of two locally significant species, note that in 2005, one *Amyema quandang* and three *Opercularia ?varia* were detected.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of two hours and five minutes on 12/11/04 and 7/2/05 using this study's standard approach described in Section 2.3. This included:
 - Description of the structural and floristic composition of each type of native vegetation;
 - Compilation of a list of indigenous and introduced plant species, including the species' abundances and the threat level of all weed species;
 - Assessment of habitat score;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- The report, '*Vegetation monitoring of Eastern Freeway (Doncaster Road to Springvale Road), Melbourne, Victoria*', by J. Yugovic in 2002 – report of Biosis Pty Ltd project 2876 for VicRoads;
- The report by Yugovic J.V., Crosby D.F., Ebert K., Lillywhite P., Saddler S.R., Schulz M., Vaughan P.J., Westaway J. and Yen A.L. (1990). '*Flora and Fauna of the Koonung and Mullum Mullum Valleys (Proposed Eastern Arterial Road and Ringwood Bypass), Victoria*'. Victorian Dept of Conservation, Forests & Lands : East Melbourne. v + 158 pp + 2 maps;
- Data from the Department of Sustainability & Environment's flora and fauna databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

As noted under the heading, Priority actions, the slope vegetation should be surveyed after it has been given a chance to recover from mowing (if this is allowed to occur).

Site 2. Koonung Creek Reserve, Balwyn North

A linear park with extensive revegetation and artificial wetlands. Melway ref. 32 F11.

Site Biological Significance Level: *Local* (tentatively)

Summary of significant natural assets

- There are five locally threatened plant species, three of which have viable populations;
- Numerous locally threatened fauna species have been recorded;
- The artificial wetlands provide habitat for fauna;
- The site is serving as an ecological corridor for some wildlife, and this is expected to increase.

Physical features

Site area: 32.3 hectares

Elevation: 20-25m.

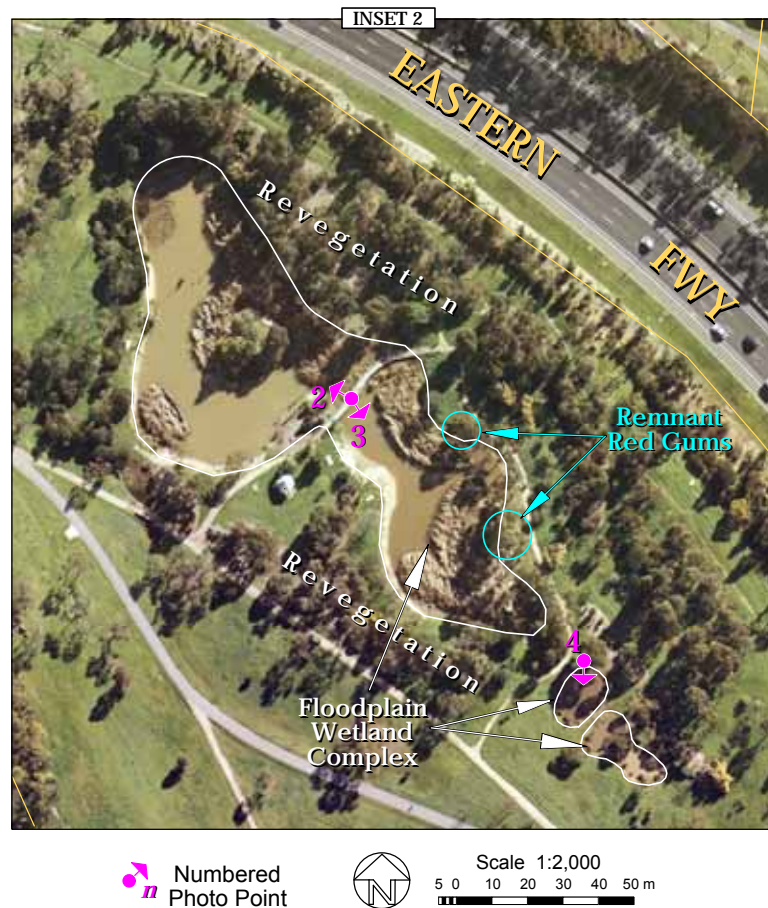
Landform: The natural landform was the floor of a shallow valley and the lower slope abutting to the south. The natural topography has been modified by earthwork to fill in the original creek and create a wetland area and embankments.

Slope: Mostly almost flat, but becoming moderately steep on some embankments created by earthworks.

Soil type: Greatly modified by earthwork. The native soil of the floodplain was alluvial sand, and the native soil on the slope adjacent to Kosciusko Rd and Carron St was (and mostly still is) thin, light grey loam over mottled yellowish clay.

Underlying geology: The bedrock is part of the Silurian 'Andersons Creek' formation, which comprises siltstone and sandstone. On the valley floor, the bedrock has been covered by stream alluvium in recent geological time.





Boundaries

The site is the whole of Koonung Creek Reserve and its edge coincides with property boundaries, as outlined in red on the aerial photograph.

Land use & tenure: Council linear reserve for drainage and recreation.

Site description

The site is a linear park that serves as a buffer to the Eastern Freeway. Koonung Creek used to flow in the valley that the park follows, but it has been replaced by a pipe.

The reserve serves functions for drainage and recreation, but the features of biological interest are:

- Artificially created wetlands in the reserve's northeast (Inset 2 of the aerial photographs), with planted and natural flora;
- A small number of remnant eucalypts;
- A small area of native grasses in the northwest (Inset 1 of the aerial photographs);
- Plantings of indigenous species and Australian native trees widespread around the reserve, providing habitat for native birds and insects.

Inset 2 above shows two River Red Gums (*Eucalyptus camaldulensis*) that appear to predate the freeway construction (but not large enough to qualify as 'large old trees' under the criteria of the Department of Sustainability & Environment). There are many indigenous amphibious plants such as rushes that have volunteered themselves at the water's edge, brought in by waterbirds. The shallow slope at the water's edge provides suitable habitat for native wetland flora and fauna, including herons, cormorants and frogs.

Toward the south of the reserve, there is a large, old River Red Gum outside the back fence of 39 Gardenia Rd and a possibly natural young Manna Gum (*E. viminalis*) or Candlebark (*E. rubida*) outside the back fence of 45 Gardenia Rd. There is also a medium-sized River Red Gum just outside the reserve in 39 Gardenia Rd, in particularly good condition.

A berm (or long, earth mound) has been created next to the freeway, now densely planted with indigenous species and Australian natives. At the base of the berm next to the freeway fence, north of Carron St, there is a solitary, large, remnant River Red Gum (*Eucalyptus camaldulensis*) marked on the broad-scale aerial photograph. Several smaller River Red Gums

(20-40 cm trunk diameter) marked on the berm north of Balwyn Rd also appear to be remnants of natural vegetation, with some remnant Veined Spear-grass (*Austrostipa rudis*) beneath them.

The planting on the berm, combined with Australian native trees that are planted widely elsewhere in the reserve, will function increasingly as a corridor for native birds and insects as the trees mature.

There are nine indigenous plant species (five of them in the wetlands) that may have been planted or may be naturally occurring.

Ecological links with other land

This site is on the Koonung Creek ecological corridor, which still facilitates movements of some bird species (see the section on fauna habitat below). Revegetation continues along the course of Koonung Creek to the southeast of the reserve.

Habitat types

Water Body (No EVC number). The artificial wetlands provide open water habitat for ducks and other aquatic life.

Floodplain Wetland Complex (EVC 172, regionally Endangered) – artificially created.

This EVC includes the fringing vegetation of the wetlands shown in Inset 2 above. 12 indigenous plant species were found, of which between 1 and 6 have been planted.

Dominant species: Patches of *Melaleuca ericifolia* may be natural regrowth or planted. The ground flora are dominated by *Typha ?domingensis*, *Juncus amabilis* and *Juncus sarophorus*, which appear to be all naturally occurring. *Alternanthera denticulata* is abundant in patches. The characteristic species *Azolla filiculoides* and *Lemna disperma* are present.

Native grass patch (No EVC number) – natural regeneration on an embankment.

1,600 m² in the area outlined on Inset 1 above. This is too small to qualify as a ‘remnant patch’ under the *Native Vegetation Framework*.

Dominant species: *Austrodanthonia setacea*, *A. racemosa* and *A. fulva*.

Flora of special significance

The terms ‘vulnerable’ and ‘endangered’ below are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Last Record	Notes
Critically Endangered	<i>Eucalyptus viminalis/rubida</i>	2005	One specimen, possibly planted
Vulnerable	<i>Austrodanthonia eriantha</i>	2005	Moderate numbers in the native grass patch
Vulnerable	<i>Austrodanthonia tenuior</i>	2005	Scarce
Vulnerable	<i>Phragmites australis</i>	2005	
Vulnerable	<i>Typha ?domingensis</i>	2005	Abundant around the largest wetland

Full flora list

The following table includes all species found at the site during this study, categorised according to four areas of the reserve. An ‘M’ in a grid square means that many plants were found in the corresponding section of the reserve. Similarly, ‘-’ means that very few plants were found, and a tick indicates intermediate numbers.

Species Name	Wetlands	Around wetlands	Grass areas	Native grass patch	Species Name	Wetlands	Around wetlands	Grass areas	Native grass patch
Indigenous, naturally occurring					<i>Epilobium hirtigerum</i>				
<i>Alternanthera denticulata</i>	M				<i>Eucalyptus camaldulensis</i>		✓		
<i>Austrodanthonia eriantha</i>				✓	<i>Eucalyptus viminalis/rubida</i>				✓
<i>Austrodanthonia fulva</i>				M	<i>Juncus amabilis</i>	M			
<i>Austrodanthonia racemosa</i>			✓	M	<i>Juncus sarophorus</i>	M			
<i>Austrodanthonia setacea</i>			✓	M	<i>Lemna disperma</i>	✓			
<i>Austrodanthonia tenuior</i>				-	<i>Phragmites australis</i>	✓			
<i>Austrostipa rudis</i> subsp. <i>rudis</i>			✓		<i>Portulaca oleracea</i>				✓
					<i>Typha ?domingensis</i>	M			

Species Name	Wetlands	Around wetlands	Grass areas	Native grass patch	Species Name	Wetlands	Around wetlands	Grass areas	Native grass patch
Possibly planted					Planted				
<i>Acacia dealbata</i>			✓		<i>Acacia melanoxylon</i>		✓		
<i>Acacia mearnsii</i>			✓		<i>Callistemon sieberi</i>		✓		
<i>Azolla filiculoides</i>	✓				<i>Clematis microphylla</i>		—		
<i>Carex appressa</i>	✓				<i>Dianella longifolia</i> s.l.		✓		
<i>Coprosma quadrifida</i>			✓		<i>Eucalyptus camaldulensis</i>		✓		
<i>Crassula helmsii</i>	✓				<i>Eucalyptus melliodora</i>		✓		
<i>Juncus pauciflorus</i>	✓				<i>Leptospermum scoparium</i>		—		
<i>Melaleuca ericifolia</i>	M				<i>Myoporum</i> sp. 1		✓		
<i>Poa morrisii</i>			✓		? <i>Pomaderris racemosa</i>		—		
					<i>Schoenoplectus tabernaemontani</i>	✓			
					? <i>Spyridium parvifolium</i>		—		
Environmental weeds									
					<i>Aster subulatus</i>	✓			
					<i>Coprosma repens</i>		—		
					<i>Cyperus eragrostis</i>	✓			
					<i>Juncus articulatus</i>	✓			
					<i>Nassella trichotoma</i>		—		
					<i>Nasturtium officinale</i>	✓			
					<i>Paspalum distichum</i>	✓			
					<i>Pennisetum clandestinum</i>	✓			

Large old trees

As shown on the broad-scale aerial photograph, there are two River Red Gums (*Eucalyptus camaldulensis*) that qualify as large old trees according to the Department of Sustainability & Environment's criteria for the EVCs in which these trees germinated. The more northerly one, next to the freeway, has a trunk diameter of 0.94m and is in good health. The other one, behind 39 Gardenia Rd, has a trunk diameter of 0.8 m and is also in good health. They are probably both well over 100 years old.

Fauna of special significance

The significant fauna species in the list below have been observed at Koonung Creek Reserve. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18). Only the Yellow-rumped Thornbill has a record of confirmed breeding from the reserve.

Conservation Status		Species Name	Last Record
Melbourne	Boroondara		
Endangered	Occasional Visitor	Cockatiel	1999
Rare	Endangered	Darter	2000
	Endangered	Great Cormorant	2000
	Endangered	Sacred Kingfisher	1999
	Endangered	Spotted Pardalote	2000
	Endangered	Yellow-rumped Thornbill	2000
	Vulnerable	Little Pied Cormorant	2005
	Vulnerable	Little Black Cormorant	2000
	Vulnerable	White-faced Heron	2005
	Vulnerable	Brown Goshawk	2000
	Vulnerable	Australian Hobby	2000
	Vulnerable	Yellow-tailed Black-Cockatoo	2000
	Vulnerable	Musk Lorikeet	2000

Conservation Status		Species Name	Last Record
Melbourne	Boroondara		
	Vulnerable	Little Lorikeet	2000
	Vulnerable	Eastern Rosella	2005
	Vulnerable	Laughing Kookaburra	1999
	Vulnerable	Grey Shrike-thrush	1998
	Vulnerable	Black-faced Cuckoo-shrike	2000
	Occasional Visitor	Australian Pelican	1999
	Occasional Visitor	White-necked Heron	1999
	Occasional Visitor	Common Bronzewing	2000
	Occasional Visitor	Gang-gang Cockatoo	1998
	Occasional Visitor	Scarlet Robin	2000

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed. The bird list is likely to be fairly complete, because it includes monthly records from a bird observer between November 1998 and January 2002.

Butterflies		Birds (continued)		Birds (continued)	
Australian Painted Lady	2005	Australian White Ibis	1999	Sacred Kingfisher	1999
*Cabbage White	2005	Brown Goshawk	2000	Spotted Pardalote	2000
Common Brown	2005	Australian Hobby	2000	†Yellow-rumped Thornbill	2000
		Dusky Moorhen	1998	†Red Wattlebird	2000
Fish		Masked Lapwing	1999	Brush Wattlebird	2005
*Mosquitofish	2005	Silver Gull	1999	†Noisy Miner	2005
		*Rock Dove	2000	White-plumed Honeyeater	2000
Mammals		*Spotted Turtle-Dove	2005	Scarlet Robin	2000
Common Brushtail Possum	2000	Common Bronzewing	2000	Grey Shrike-thrush	1998
Common Ringtail Possum	2002	Yellow-tailed Black-Cockatoo	2000	†Magpie-lark	2005
				†Willie Wagtail	2005
Birds		Gang-gang Cockatoo	1998	Black-faced Cuckoo-shrike	2000
†Australian Wood Duck	2000	Galah	2005	Grey Butcherbird	2000
†Pacific Black Duck	2000	Long-billed Corella	2000	†Australian Magpie	2005
Chestnut Teal	1998	Sulphur-crested Cockatoo	1999	Pied Currawong	2000
Darter	2000	Cockatiel	1999	Little Raven	2005
Little Pied Cormorant	2005	Rainbow Lorikeet	2000	Richard's Pipit	1998
Little Black Cormorant	2000	Musk Lorikeet	2000	*House Sparrow	1998
Great Cormorant	2000	Little Lorikeet	2000	†Welcome Swallow	2005
Australian Pelican	1999	Eastern Rosella	2005	*Common Blackbird	2005
White-faced Heron	2005	Red-rumped Parrot	2005	*Common Starling	2005
White-necked Heron	1999	Laughing Kookaburra	1999	*†Common Myna	2005

Fauna habitat

The wetlands are used by herons and cormorants for feeding, and it is possible that the island or dead tree in the main wetland could be used for waterbird breeding. Frogs are bound to be present around the wetlands, but were not detected during this study due to weather and seasonal factors. The water in the wetlands contains aquatic life that was not investigated in this study, other than the observations of many dragonflies, damselflies and the serious pest species, the Mosquitofish.

The planted trees and shrubs provide feeding and nesting habitat for native woodland birds and insects.

The open, grassy areas were observed to provide a feeding ground for substantial numbers of Red-rumped Parrots, Little Ravens, Australian Magpies and Welcome Swallows.

Corridors

The direction of flight of the Red-rumped Parrot, Little Pied Cormorant and White-faced Heron indicates that the reserve has at least a basic function as an ecological corridor between the Yarra River (1.2 km to the west) and locations further east along the Koonung Creek valley. This function should increase as the revegetation on the berm beside the freeway matures.

Site significance rating

Rare or threatened plants

The site supports viable populations of *Austrodanthonia eriantha*, *Phragmites australis* and *Typha ?domingensis*, all of which are vulnerable in Boroondara and therefore qualify the site for **Local** significance according to BioSites criterion 3.1.5 of the Department of Sustainability & Environment (Amos 2004). Note that these assets are localised only at the wetlands and the native grass patch.

Regionally threatened Ecological Vegetation Class

If the wetlands were natural, they would qualify for State significance under criterion 3.2.3 of Amos (2004) because wetlands are endangered EVCs. However, that criterion relies on the vegetation meeting a definition of a 'remnant patch' that will appear in the forthcoming document, '*Operational guidelines: applying net gain in the planning system*'. It seems likely that the definition will exclude cases like the wetlands of interest here because the topography and hydrology are quite different from natural. Until this is clarified, no significance is claimed under this criterion.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds, particularly of wetlands. The species of concern are: <ul style="list-style-type: none"> • Very serious: Jointed Rush (<i>Juncus articulatus</i>), Water Couch (<i>Paspalum distichum</i>), Kikuyu (<i>Pennisetum clandestinum</i>); • Serious: Aster-weed (<i>Aster subulatus</i>), Mirror-bush (<i>Coprosma repens</i>), Drain Flat-sedge (<i>Cyperus eragrostis</i>), Serrated Tussock (<i>Nassella trichotoma</i>), Squirrel-tail Fescue (<i>Vulpia bromoides</i>). 	All	Moderate	Current
Eucalypt dieback disease due to psyllids and/or leaf skeletonisers. This threat appears to have been a problem previously and is likely to recur from time to time.	Eucalypts	Low	Potential
Borer attack of wattles.	Wattles	Low	Current
Eventual loss of <i>Eucalyptus viminalis/rubida</i> from the site when the sole existing specimen in the reserve dies. If it turns out to be <i>E. rubida</i> , and if it has not been planted, this would be the loss of the last of the species in Boroondara.	Locally threatened species	Moderate	Indefinite

Priority actions

1. Annually hand-weed the two small wetlands to the east of the main lake to remove the bulk of the mass of Jointed Rush, Water Couch and any other weed with comparable cover. It is unrealistic to expect full control over these weeds, but if their mass can be kept in check, native species will continue to thrive alongside the weeds.
2. If, in the course of conducting the above weeding, it is found that Cumbungi has come to fill at least 25% of any one of the wetlands, arrange cutting and removal of Cumbungi growth in autumn. This should remove phosphorus and nitrogen from the wetlands that accumulates from urban runoff. Cutting should be done below water level to retard regrowth.
3. Collect and raise seed of *Austrodanthonia eriantha* for re-planting into the native grass patch to increase the numbers of this locally rare species. Apart from this site, the only other sites in Boroondara where this species has been seen in the past decade are Yarra Bend Park and Beckett Park (where fairly abundant). It should also be planted at Winfield Road Reserve (Site 1) if mowing there is to be reduced (as recommended in this report).
4. Schedule arboricultural checks of the health of the eucalypts marked on the aerial photographs every few years, and more frequently during drought.

Future revegetation

No additional revegetation is required.

The reserve is not generally a good place for seed collection because there are so many plants that have been planted from stock of unknown provenance. In many cases, it is hard to tell whether a species is present through natural means.

Monitoring

This study found no pre-existing data suitable for ecological monitoring.

The following items have been gathered to provide a baseline for future monitoring:

- Four photographs as displayed below and marked on the aerial photographs. Original digital images are available separately. Repeat the photographs about every two years.
- Separate flora species lists for: (a) amphibious species in the wetlands; and (b) species in the native grass patch;
- Health ratings for the trees marked on the aerial photographs. All but one of the marked trees was in good health, the exception being one in poor health in the group on the berm north of Balwyn Road.

Monitoring photographs, taken 7th February 2005

The locations and orientations of the photographs are shown by numbered arrows on the aerial photographs.



Site 2, Photo 1. The eastern end of the native grass patch (behind the bollards), showing the extent of cover of wallaby-grasses.



Site 2, Photo 2. Westward view from the bend in the bridge over the lake to show fringing vegetation and the size of the trees.



Site 2, Photo 3. South-eastward view from the bend in the bridge over the lake, for the same purpose as Photo 2.



Site 2, Photo 4. Southward view over the small wetland to the southeast of the lake in the previous two photographs. This is to show the cover of the fringing vegetation.

Information sources used in this assessment

- A vegetation and habitat survey by Graeme and David Lorimer for two hours and 25 minutes on 7th February 2005 using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species in each of four parts of the reserve;
 - Assessment of all remnant eucalypts;

- Photography for monitoring;
- Incidental fauna observations; and
- Checks for fauna habitat, ecological threats and management issues;
- Data from the Department of Sustainability & Environment's flora and fauna databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

No additional surveys seem warranted.

Once the Department of Sustainability & Environment publishes '*Operational guidelines: applying net gain in the planning system*', the definition of a 'remnant patch' should be checked to see if the wetland vegetation complies. If so, the significance level of the site should be upgraded to State.

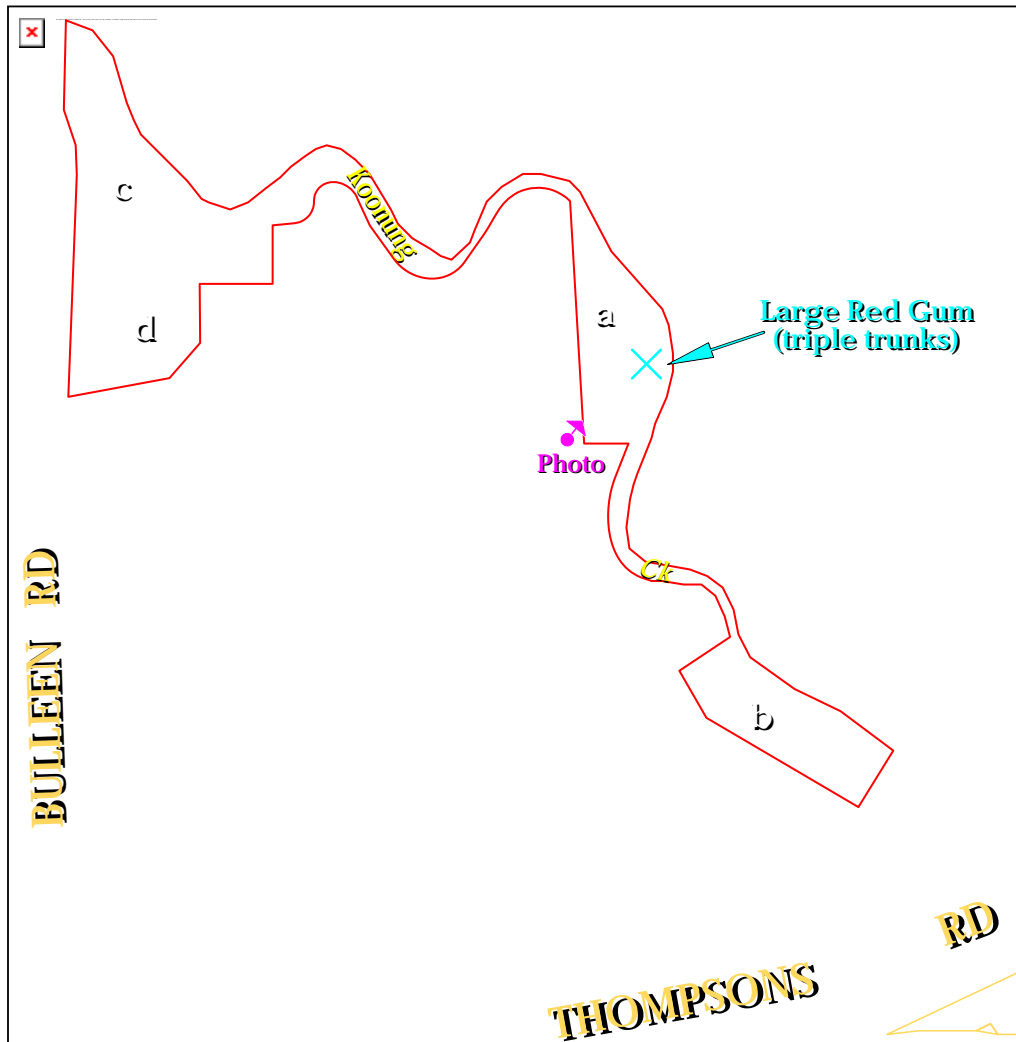
Site 3. Koonung Creek East of Bulleen Rd, Balwyn North

Sections of creek bank beside Boroondara Tennis Centre. Melway ref. 32 D10.

Site Biological Significance Level: *Local*

Summary of significant natural assets

- There are viable populations of five locally threatened plant species;
- There is one large, old River Red Gum (*Eucalyptus camaldulensis*) in very good health;
- Revegetation offers the hope of strengthening the Koonung Creek ecological corridor.



Boundaries

The site is outlined in red on the aerial photograph above. Koonung Creek follows the boundary, and the municipality of Manningham lies on the other side of the creek.

Land use & tenure: Creek reserve and part of a tennis centre. The City of Boroondara is responsible for both.

Physical features

Site area: 0.7 hectares

Elevation: 11 m at the creek's normal water level, 14m on the floodplain, rising to 21 m on a small knoll at the southeastern corner of section 'd' on the aerial photograph (near the tennis pavilion).

Landform: Floodplain, creek and a small, artificial knoll.

Slope: The creek channel has steep sides. The floodplain is almost flat. Section 'd' on the aerial photograph has a gradient up to 1:5, with an aspect from west to north.

Soil type: Fine to medium alluvial sand on the floodplain; Clay fill in section 'd' on the aerial photograph.

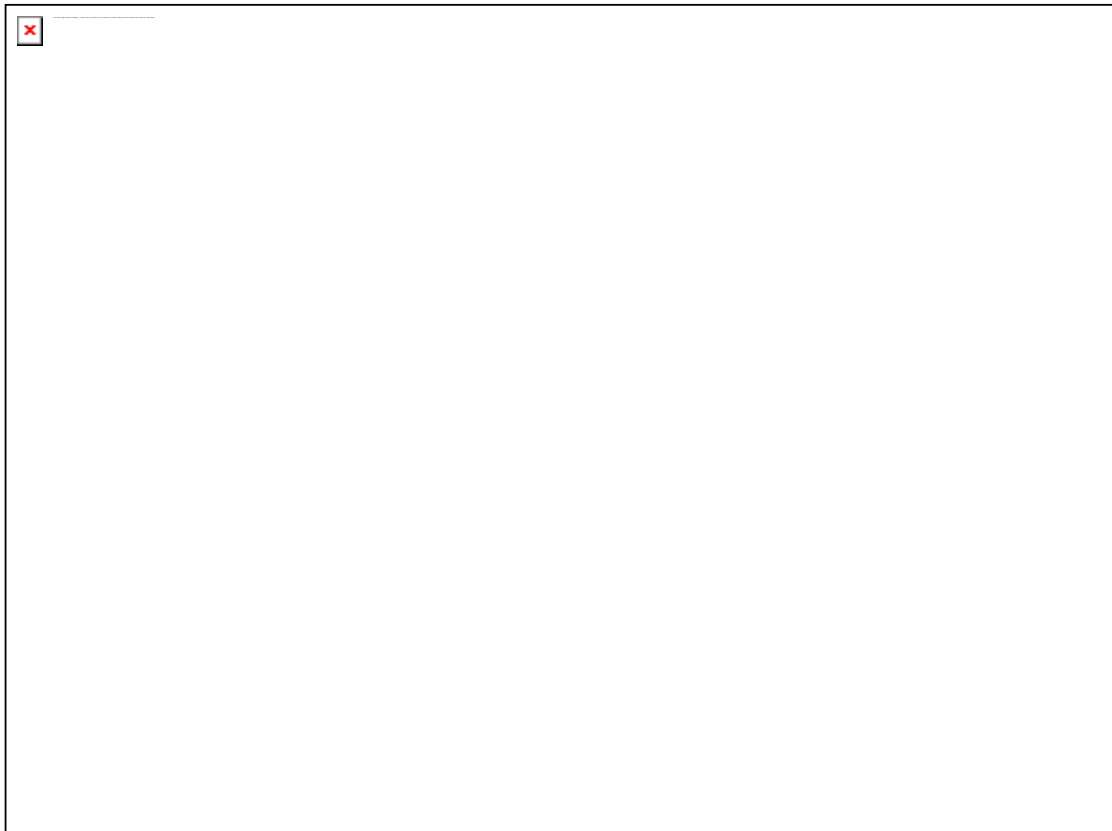
Underlying geology: The floodplain comprises alluvium from recent river deposits and an ancient lake. The bedrock is part of the Silurian 'Andersons Creek' formation, which comprises siltstone and sandstone.

Site description

Koonung Creek emerges from a pipe at the southeastern end of this site, having flowed underground for more than 2km beneath the eastern freeway, Koonung Creek Reserve and Thompsons Rd. In section 'b' of the site shown on the aerial photograph, the creek resumes its natural course. Most of section 'a' and the eastern end of section 'c' retain the soil and approximate topography of the original floodplain. Clay fill covers the rest of the site, raising the Boroondara Tennis Centre above most floods.

The steep side of the creek channel is mostly very weedy, but it retains several plant species characteristic of natural stream channels: three rushes (*Juncus* species), Common Reed (*Phragmites australis*) and Slender Knotweed (*Persicaria decipiens*).

There are several remnant River Red Gums (*Eucalyptus camaldulensis*) on the floodplain, the largest of which is the conspicuous triple-trunked tree in the photograph below. The large tree supports a small amount of Creeping Mistletoe (*Muellerina eucalyptoides*). The only other naturally occurring indigenous plants on the floodplain are the hardy species, Common Blown-grass (*Lachnagrostis filiformis* = *Agrostis avenacea*), Hairy Willow-herb (*Epilobium hirtigerum*), *Geranium* sp. 5 and Weeping Grass (*Microlaena stipoides*). These occur among the young revegetation seen in the photograph below.



Photograph of section 'a', looking north-northeast from the location shown on the aerial photograph, to show the condition and crown luxuriance of the River Red Gums and the state of the year-old revegetation.

Earlier revegetation was planted in section 'b' of the aerial photograph, where there are also some senescent Black Wattles (*Acacia mearnsii*) with the locally threatened Grey Mistletoe (*Amyema quandang*) growing on them. The ground flora

there comprises entirely weeds, particularly Kikuyu Grass (*Pennisetum clandestinum*) and Toowoomba Canary-grass (*Phalaris aquatica*).

Section 'c' on the aerial photograph contains some River Red Gums and Black Wattles in the east on what appears to be the native soil. The rest of this section is an embankment of clay fill, with a few decrepit indigenous plants from a failed revegetation attempt. This section is included in the site because of its potential for revegetation and the strategic importance of its location beside Koonung Creek.

The clay fill is highest in section 'd' on the aerial photograph, and the plants growing there are predominantly indigenous. It is not clear whether the River Red Gums that grow there were planted or volunteered themselves. Two other indigenous species, Nodding Saltbush (*Einadia nutans*) and Golden Wattles (*Acacia pycnantha*), have germinated from parents that may have been planted or may have volunteered themselves. Most of the wattles are mown to a few centimetres tall. The rough lawn is dominated by the indigenous Clustered Wallaby-grass (*Austrodanthonia racemosa*). Although these plants are growing on an artificial knoll in soil imported from elsewhere, they represent a rudimentary form of the Plains Grassy Woodland that occurred naturally on the nearby hillsides.

Between sections a, b and c on the aerial photograph, the site contracts to the creek and its channel due to the absence of native vegetation on the banks beyond the channel. The bare branches of elms stand out in the aerial photograph, which was taken in winter 2004. The elms, and the very weedy ground flora beneath them, make it impractical to restore native vegetation there. The opposite side of the creek, in Manningham, offers much more potential for creek restoration.

Ecological links with other land

This site is on the Koonung Creek ecological corridor, which still facilitates movements of some bird species (see the section on fauna on p. 64).

Manningham City Council is responsible for the opposite side of Koonung Creek. If the creek's vegetation is to be restored, the Manningham side offers greater potential than the Boroondara side. Note that trees on the northern side of the creek would provide more effective shade to the creek, which is important for stream ecology.

Habitat types

Perennial Stream (No EVC number).

Floodplain Riparian Woodland (EVC 56, endangered in the Gippsland Plain bioregion) – vestiges plus revegetation

Canopy trees: *Eucalyptus camaldulensis*, to 0.81 metres trunk diameter, now very sparse.

Lower trees: Several *Acacia mearnsii* persist, and there is an *Acacia melanoxylon* on the opposite side of the creek.

Shrubs, vines, ferns: None remaining.

Amphibious flora: In the creek channel, among many weeds, there are scattered plants of *Juncus amabilis*, *Juncus pauciflorus*, *Juncus usitatus*, *Persicaria decipiens* and *Phragmites australis*.

Ground flora: Outside the creek channel, the young revegetation provides much more ground coverage than the naturally occurring indigenous plants. The latter includes *Lachnagrostis filiformis* = *Agrostis avenacea*, *Epilobium hirtigerum*, *Geranium* sp. 5 and *Microlaena stipoides*.

Plains Grassy Woodland (EVC 55, endangered in the Gippsland Plain bioregion) – vestiges growing on clay fill

Canopy trees: *Eucalyptus camaldulensis*

Lower trees: None.

Shrubs: *Acacia pycnantha*, mostly mown to a few centimetres tall.

Vines and ferns: None.

Ground flora: Dominated by *Austrodanthonia racemosa*, as in the case of many other rough lawns in Boroondara.

Flora of special significance

The conservation status ratings below (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Last Record	Notes
Melbourne	Boroondara			
Rare or threatened	Vulnerable	<i>Juncus usitatus</i>	2005	
	Endangered	<i>Geranium</i> ?sp. 5	2005	
	Vulnerable	<i>Juncus pauciflorus</i>	2005	
	Vulnerable	<i>Phragmites australis</i>	2005	
	Vulnerable	<i>Acacia pycnantha</i>	2005	Numerous
	Vulnerable	<i>Amyema quandang</i>	2005	On senescent <i>Acacia mearnsii</i>

Full flora list

The following table includes all species found at the site during this study, categorised according to five sections of the site. Sections 'a' to 'd' are marked on the aerial photograph, and section 'e' is the creek channel. In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; '-' means that very few plants were found; and a tick indicates moderate numbers.

Species Name	- Section -					Species Name	- Section -					Species Name	- Section -				
	a	b	c	d	e		a	b	c	d	e		a	b	c	d	e
Indigenous, naturally occurring																	
<i>Acacia mearnsii</i>		D	✓			<i>Coprosma quadrifida</i>	-					<i>Eragrostis mexicana</i>	M	✓			
<i>Acacia pycnantha</i>				M		<i>Dianella longifolia</i> s.l.	✓					<i>Euphorbia pepus</i>	✓				
<i>Amyema quandang</i>		✓				<i>Eucalyptus camaldulensis</i>	✓	M				<i>Foeniculum vulgare</i>		✓			
<i>Austroanthonia racemosa</i>				D		<i>Goodenia ovata</i>	M	-				<i>Fraxinus angustifolia</i>	✓	✓		-	
<i>Einadia nutans</i>				-		<i>Gynatrix pulchella</i>			-			<i>Galenia pubescens</i>	-			-	
<i>Epilobium hirtigerum</i>	✓					<i>Juncus pallidus</i>	-					<i>Galium aparine</i>	-	✓			
<i>Eucalyptus camaldulensis</i>	D		✓	D		<i>Juncus pauciflorus</i>	✓					<i>Genista linifolia</i>			D		
<i>Geranium ?sp. 5</i>	✓					<i>Juncus sarophorus</i>	✓					<i>Helminthotheca echioides</i>	✓	✓			
<i>Juncus amabilis</i>				✓		<i>Kunzea ericoides</i> spp. agg.	✓					<i>Holcus lanatus</i>	-				
<i>Juncus pauciflorus</i>				✓		<i>Lomandra longifolia</i>	✓					<i>Lolium perenne</i>	✓				
<i>Juncus usitatus</i>				✓		<i>Melaleuca ericifolia</i>	✓					<i>Lycium ferocissimum</i>		✓	✓		
<i>Lachnagrostis filiformis</i>	✓					<i>Olearia lirata</i>	✓					<i>Modiola caroliniana</i>	✓				
<i>Microlaena stipoides</i>	-					<i>Ozothamnus rosmarinifolius</i>	-					<i>Opuntia</i> sp.			M		
<i>Muellerina eucalyptoides</i>	✓	✓	✓			<i>Poa ensiformis</i>	✓					<i>Paspalum distichum</i>	-			✓	
<i>Persicaria decipiens</i>				✓		<i>Poa labillardierei</i>	✓					<i>Pennisetum clandestinum</i>		D	M		
<i>Phragmites australis</i>				✓		<i>?Spyridium parvifolium</i>	-					<i>Persicaria maculosa</i>	✓				
<i>Portulaca oleracea</i>	M	✓				<i>Viminaria juncea</i>	✓					<i>Phalaris aquatica</i>	-	M			
Planted																	
<i>Acacia acinacea</i> s.l.	-					Environmental weeds					<i>Plantago lanceolata</i>	✓	✓	✓			
<i>Acacia dealbata</i>		M				<i>Acacia longifolia</i> subsp. <i>longifolia</i>		-			<i>Polygonum aviculare</i>	-					
<i>Acacia implexa</i>	-					<i>Acer negundo</i>	-				<i>Raphanus raphanistrum</i>			✓			
<i>Acacia melanoxylon</i>	✓	M				<i>Allium triquetrum</i>	✓				<i>Ricinus communis</i>	-		✓			
<i>Acacia paradoxa</i>	-					<i>Aster subulatus</i>	M				<i>Rubus anglocandicans</i>	-		✓			
<i>Acacia verticillata</i>	✓					<i>Brassica fruticulosa</i>	M	✓	✓		<i>Salix babylonica</i> s.l.					-	
<i>Austroanthonia fulva</i>	M					<i>Bromus catharticus</i>	✓		-		<i>Solanum nigrum</i>	M	✓	M			
<i>Austroanthonia racemosa</i>	✓					<i>Cirsium vulgare</i>	✓				<i>Solanum pseudocapsicum</i>	-					
<i>Austroanthonia setacea</i>	M					<i>Conyza sumatrensis</i>			-		<i>Solidago canadensis</i>	-					
<i>Bursaria spinosa</i>		✓				<i>Cynodon dactylon</i>			✓		<i>Sonchus oleraceus</i>	-					
<i>Carex appressa</i>	✓					<i>Cyperus eragrostis</i>	✓				<i>Trifolium repens</i>	✓					
						<i>Echinochloa ?crus-galli</i>	M				<i>Ulmus</i> sp.	✓					
						<i>Ehrharta erecta</i>	✓	✓			<i>Vicia ?hirsuta</i>	✓					
											<i>Vinca major</i>	✓	✓	✓			

Large old tree

The triple-trunked River Red Gum (*Eucalyptus camaldulensis*) marked on the aerial photograph and depicted in the photograph on the previous page is the only one on the site that qualifies as a large old tree according to the Department of Sustainability & Environment's criteria. The diameter of the largest of its three trunks is 81 cm. The tree's health was rated as very good.

Full fauna list

The following list was compiled during the one hour and twenty-five minutes of fieldwork in April 2005, and is bound to be quite incomplete. None of these species is rare or threatened in Boroondara or more widely. Asterisks indicate introduced species.

Birds

Pacific Black Duck
Chestnut Teal
Dusky Moorhen
Silver Gull

*Spotted Turtle-Dove
Rainbow Lorikeet
Noisy Miner
Grey Butcherbird

Australian Magpie
Little Raven
*Common Starling

Frogs

Common Froglet

Site significance rating

Rare or threatened plants

The populations of the locally threatened species, *Juncus usitatus*, *Geranium* ?sp. 5, *Juncus pauciflorus* and *Phragmites australis* all appear to be viable, when one takes into account the biology of these species and the proximity to other individuals at the Freeway Golf Course (Site 4) on the other side of Bulleen Rd. Viable populations of locally threatened species qualifies the site for **Local** significance according to BioSites criterion 3.1.5 of the Department of Sustainability & Environment (Amos 2004).

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Very serious: Flax-leaved Broom (<i>Genista linifolia</i>), Water Couch (<i>Paspalum distichum</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Toowoomba Canary-grass (<i>Phalaris aquatica</i>), Elm (<i>Ulmus</i> sp.), Blue Periwinkle (<i>Vinca major</i>); • Serious: Sallow Wattle (<i>Acacia longifolia</i> subsp. <i>longifolia</i>), Box Elder (<i>Acer negundo</i>), Angled Onion (<i>Allium triquetrum</i>), Aster-weed (<i>Aster subulatus</i>), Twiggy Turnip (<i>Brassica fruticulosa</i>), Prairie Grass (<i>Bromus catharticus</i>), Spear Thistle (<i>Cirsium vulgare</i>), Couch (<i>Cynodon dactylon</i>), Drain Flat-sedge (<i>Cyperus eragrostis</i>), Common Barnyard Grass (<i>Echinochloa ?crus-galli</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Mexican Love-grass (<i>Eragrostis mexicana</i>), Petty Spurge (<i>Euphorbia peplus</i>), Fennel (<i>Foeniculum vulgare</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Galenia (<i>Galenia pubescens</i> var. <i>pubescens</i>), Cleavers (<i>Galium aparine</i>), Ox-tongue (<i>Helminthotheca echinoides</i>), Yorkshire Fog (<i>Holcus lanatus</i>), Perennial Rye-grass (<i>Lolium perenne</i>), African Box-thorn (<i>Lycium ferocissimum</i>), Carolina Mallow (<i>Modiola caroliniana</i>), Prickly Pear (<i>Opuntia</i> sp.), Persicaria (<i>Persicaria maculosa</i>), Ribwort (<i>Plantago lanceolata</i>), Wild Radish (<i>Raphanus raphanistrum</i>), Castor Oil Plant (<i>Ricinus communis</i>), Blackberry (<i>Rubus anglocandicans</i>), Weeping Willow (<i>Salix babylonica</i> s.l.), Black Nightshade (<i>Solanum nigrum</i>), Madeira Winter-cherry (<i>Solanum pseudocapsicum</i>), Golden-rod (<i>Solidago canadensis</i> var. <i>scabra</i>), Sow-thistle (<i>Sonchus oleraceus</i>), White Clover (<i>Trifolium repens</i>), Tiny Vetch (<i>Vicia ?hirsuta</i>). 	All	High	Current
Borer attack of wattles.	Wattles	Moderate	Current
Soil erosion of the banks of Koonung Creek during flood.	Significant species in the creek channel; River Red Gums	Moderate	Any major flood
Eucalypt dieback disease due to psyllids and/or leaf skeletonisers.	Eucalypts	Low	Potential

Priority actions

1. Remove weeds from the revegetation area of section 'a' on the aerial photograph. This should be done routinely each spring (at least once) and summer, and as required following floods. The importance of this task is high.
2. Control the infestation of the declared noxious weed, Flax-leaved Broom (*Genista linifolia*) in section 'c' on the aerial photograph. The importance of this task is high.
3. Cut grass weeds in section 'b' on the aerial photograph by brushcutter each December. The importance of this task is moderate.

Future revegetation

1. Stream restoration on this section of Koonung Creek requires cooperation between Boroondara and Manningham Councils and Melbourne Water. Trees should be planted on the Manningham side to shade the creek and help stabilise the bank. *Eucalyptus camaldulensis*, *Acacia dealbata*, *Acacia melanoxylon* and *Acacia mearnsii* are suitable species, subject to consideration of their effects on the flow of floodwater.
2. Another attempt should be made to revegetate section 'c' on the aerial photograph, after controlling Flax-leafed Broom and trying to determine the cause of the previous revegetation's failure. This is of lower priority than planting trees on the opposite side of the creek.

Records should be kept of any planting done in this (or any other) site, including species, numbers and locations.

The reserve does not produce enough seed of any species to make it a good resource for seed collecting, but small quantities could be collected from the locally rare species such as *Juncus pauciflorus*.

Monitoring

This study found no pre-existing data suitable for ecological monitoring.

The following items have been gathered to provide a baseline for future monitoring:

- The aerial photograph on p. 68, to show the amount of cover of revegetation and the extent of the elms. Check each time a new aerial photograph becomes available.
- The photograph on p. 69. Repeat about every two years. Check for the health of the eucalypts and the progress of the revegetation. Note that the largest tree was rated as very good health in April 2005. A more distant photograph may become necessary as the revegetation grows.
- The separate flora species lists for the different sections of the site, presented above. Repeat every few years.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for one hour and 25 minutes on 19th April 2005 using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species in each of five parts of the site, including the species' abundances and the threat level of all weed species in each area;
 - Assessment and measuring of the larger remnant eucalypts;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

No additional investigation seems warranted.

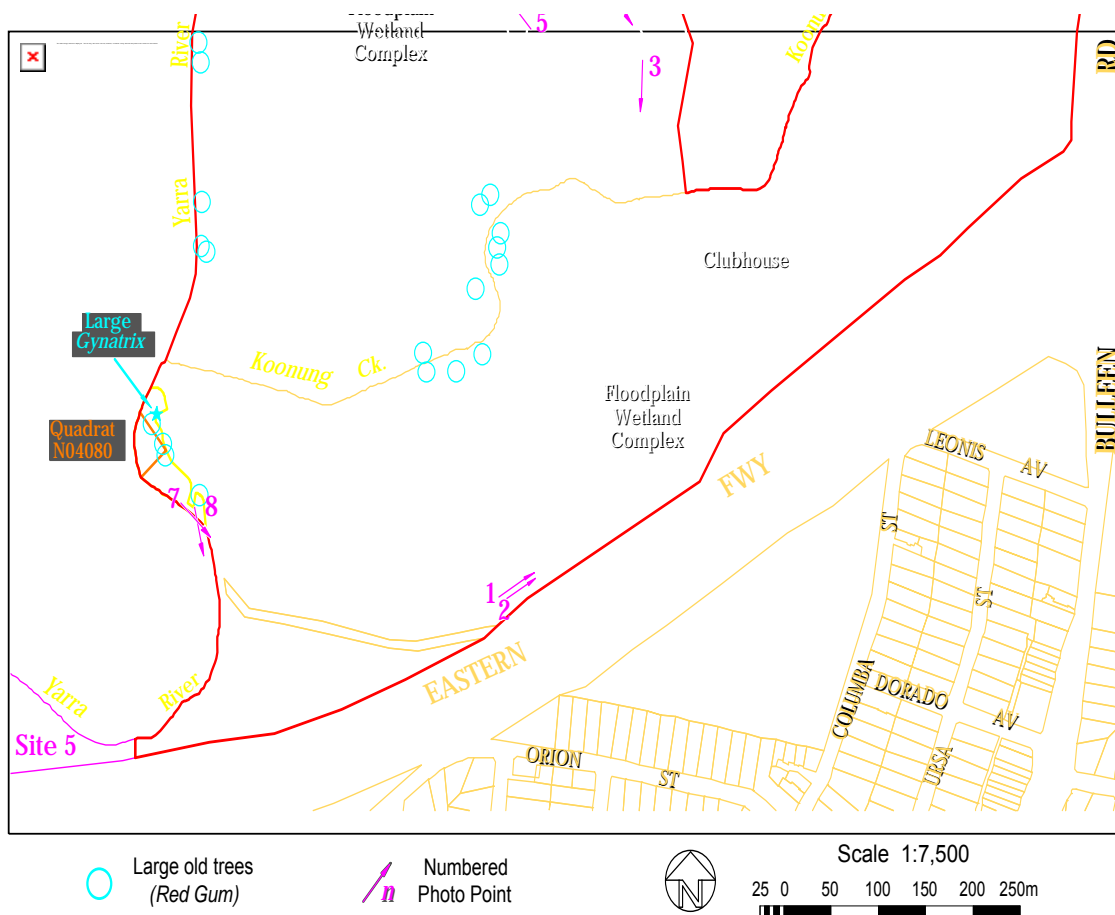
Site 4. Freeway Golf Course, Balwyn North & Bulleen

A public golf course at the confluence of the Yarra River and Koonung Creek, managed by the City of Boroondara. Melway ref. 32 B11.

Site Biological Significance Level: *State*

Summary of significant natural assets

- Includes well vegetated billabongs with rare flora and fauna;
- Both of the Ecological Vegetation Classes (EVCs) present are listed as endangered in the bioregion. They are Floodplain Riparian Woodland and Floodplain Wetland Complex (incorporating Aquatic Herbland);
- There are viable populations of numerous species of flora and fauna that are threatened in Boroondara or state-wide;
- The site is at the junction of a major ecological corridor (along the Yarra River) and a minor ecological corridor (along Koonung Creek).
- There are twenty-seven large old River Red Gums, in good health on average.



Boundaries

The site is outlined in red on the aerial photograph above. It comprises the whole of the golf course, bounded variously by fences, the Yarra River and Koonung Creek. The site boundary partly follows the cadastral boundary along Koonung Creek, which differs slightly from the current-day course of the creek.

Land use & tenure: The golf course is owned and run by Boroondara City Council, but it extends north of Koonung Ck into the municipality of Manningham. Land use alternatives are strongly limited by land zoning and planning overlays.

Physical features

Site area: 44.4 hectares

Elevation: Typically 14m across most of the course but with a ridge rising to 30m at the bridge leading across the freeway. The normal level of the Yarra River is at an elevation of 6 metres.

Landform: Includes the riverbanks, billabongs, floodplain (gently contoured to provide the fairways and greens) at the foot of a spur (on which the clubhouse and access driveway are situated).

Slope: Some of the banks of the streams and billabongs are steep. Otherwise, the gradient is slight except for the clubhouse ridge, which reaches a gradient of 1:7.

Soil type: Fine to medium alluvial sand on the floodplain; shallow, light grey duplex soil on the ridge.

Underlying geology: The floodplain comprises alluvium from recent river deposits and an ancient lake. The ridge is part of the Silurian 'Andersons Creek' formation, which comprises siltstone and sandstone.

Site description

This is one of the most biologically significant sites in Boroondara, principally for the habitat in the billabongs and along the banks of the Yarra River.

The vegetation along the Yarra River is part of a much longer corridor. Its native ground flora has been mostly replaced by weeds, but a major flood on 4th February 2005 killed most of the weeds and precipitated mass germination of native plants. Woody weeds have replaced some indigenous species of shrubs, but the indigenous Tree Violet (*Meliclytus dentatus*) remains abundant. Weed growth may come to overwhelm the indigenous ground flora again, but there is currently an opportunity to intervene with weed control in the most valuable areas and foster the regeneration of a very rare, moderately intact example of Floodplain Riparian Woodland.

The golf course has substantially modified the floodplain's topography, but some of the original billabongs remain. Each billabong is quite different from the others, due to size, depth, intermittency of flooding, slope of the banks and history of excavation. Each one supports at least one locally threatened plant species that is absent from the rest.

The most northeasterly billabong is the most ecologically significant one. It was evidently just the edge of a much larger billabong, which ornithologist, Fred T.H. Smith, remembers as having had perhaps the richest wetland life anywhere in the Melbourne area. The Carey Grammar Sports Complex replaced most of the original wetland area.

The course of Koonung Creek has been extensively straightened, leaving only small numbers of River Red Gums along its bank and some scattered remnant understorey plants in the channel.

The area of the course east of the clubhouse and car parks is not particularly biologically significant, but still provides habitat for substantial numbers of native birds.

Ecological links with other land

This site includes part of the almost unbroken corridor of vegetation that extends along the Yarra River upstream from Yarra Bend. The river and its vegetated fringe are arguably Melbourne's foremost ecological corridor. Some birds were also observed moving along Koonung Creek to and from Koonung Creek Reserve (Site 2) and beyond.

The presence of the Rufous Whistler (a migratory species from northern Australia) indicates this species uses the Yarra River as a corridor. The observed flight directions of Yellow-tailed Black-Cockatoos and New Holland Honeyeaters also suggest use of the Yarra corridor.

The direction of flight of the Red-rumped Parrots indicates that this species is using the Koonung Creek Reserve as a corridor rather than the Yarra River, at least during the time of the survey. A Little Pied Cormorant was also observed flying along the same route, even though the creek that provides the aquatic habitat needed by this species has been piped underground for approximately 2 km.

Habitat types

Perennial Stream (No EVC number).

Water Body (No EVC number). Some billabongs provide open water habitat for fish, ducks and other aquatic life.

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion)

Found mainly on the banks of the Yarra River and the billabong east of the 13th fairway, with vestiges along Koonung Creek. 38 indigenous plant species were found.

Canopy trees: *Eucalyptus camaldulensis*, to 1.23 metres trunk diameter, with crowns overlapping.

Lower trees: *Acacia dealbata* is fairly dense, and there are a few *Acacia melanoxylon*. There are small stands of *Melaleuca ericifolia* along Koonung Creek west of the clubhouse. The weed, *Fraxinus angustifolia*, is abundant along Koonung Creek.

Shrubs: *Meliccytus dentatus* (= *Hymenanthera dentata*) is rather dense and typically 2-3 m tall. *Callistemon sieberi* is scattered along the edge of both streams. The population of twenty or so *Gynatrix pulchella* beside the Yarra River is more mature than anywhere else in Boroondara, the largest specimen having a trunk girth of 45 cm. *Coprosma quadrifida* is very sparse and *Ozothamnus ferrugineus* is absent, presumably as a result of past clearing. The shrub weed, *Crataegus monogyna*, is abundant beside the billabong next to the 13th fairway.

Vines: At the time of the fieldwork (March 2005), the *Calystegia sepium/silvatica* complex was extremely abundant along the Yarra River, smothering shrubs and ground cover in the wake of the record flood one month earlier.

Ferns: None.

Ground flora: At the time of the fieldwork, *Persicaria* species, *Urtica incisa* and *Alternanthera denticulata* had regenerated profusely along the Yarra River after the recent flood. These were growing through a layer of silt and flattened, dead weeds, much of which appeared to have been *Tradescantia fluminensis*. Otherwise, the ground flora comprised predominantly introduced species, although indigenous *Juncus* species are common beside both streams. *Geranium sp. 5* is common in several, widely separated patches. *Lomandra longifolia* is very scarce but notable for the very large tussocks between Koonung Creek and the 17th fairway. *Phragmites australis* is present but scarce.

Floodplain Wetland Complex (EVC 172, regionally Endangered)

Occurring in four billabongs (see the site map), although the southernmost one is artificial or heavily modified. The most northeasterly billabong contains EVC 653, Aquatic Herbland, which is effectively a constituent of Floodplain Wetland Complex (and similarly endangered). 27 indigenous plant species were found.

Dominant species: Treeless apart from overhanging branches. The various billabongs are dominated by different herb species. The most northeasterly billabong is heavily vegetated, particularly with *Eleocharis sphacelata* and *Persicaria decipiens* at the time of inspection in March 2005. *Persicaria decipiens* and *Juncus amabilis* are common to all billabongs, and *Alternanthera denticulata* is abundant in all billabongs except the southernmost one. The regionally rare species, *Eleocharis gracilis*, is dominant around the edge of the southernmost billabong, where it is partly mown to form a fine lawn. The floating aquatics *Lemna disperma* and *Wolffia australiana* were abundant on the billabong east of the 13th fairway.

Habitat Score

A yellow outline on the aerial photograph depicts an area beside the Yarra River that is fairly uniform in ecological condition and contains the highest quality Floodplain Riparian Woodland in the site. A habitat score was calculated for this zone using the 'habitat hectare' method described in Section 2.3.4.

The calculated habitat score was 61%, which is very high in an urban context. Seven percentage points were gained for lack of weeds, and this is likely to decline (unless intervention occurs) as weeds re-establish following the February 2005 floods.

Quadrat

As part of the fieldwork for this study, a quadrat numbered N04080 in the Victorian Flora Information System was established within the zone whose habitat score was determined, as shown on the aerial photograph above. This was to provide more detailed data in an area of the site that was particularly high in vegetation quality and subject to substantial change within several years.

The quadrat has a right-angled corner at the trunk of a prominent River Red Gum (300 cm girth at breast height) at MGA coordinates 329797, 5816655. From this trunk, two edges of the quadrat radiate at compass bearings of 220° and 310° (magnetic). The remainder of the quadrat's boundary is the river's edge, giving an area of approximately 900 m. 15 indigenous species and 8 introduced species were recorded.

Another quadrat would ideally be established in the most northeastern billabong, but this was not possible in this study due to the depth of floodwater.

Flora of special significance

All but one of the species in the following table were found by the author during this study. The exception is *Rumex bidens*, which was seen by Cam Beardsell recently near the 10th fairway, but was submerged by floodwater during the author's visits.

Lepidium pseudohyssopifolium is the only species below that appears in the Department of Sustainability & Environment's advisory list of rare or threatened flora, where it is regarded as data deficient. This means that the species is suspected to be rare or threatened but that there is too little information available to be confident. The other conservation status ratings below (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status			Species Name	Last Record	Notes
Victoria	Melbourne	Boroondara			
Data Deficient	Rare or threatened	Endangered	<i>Lepidium pseudohyssopifolium</i>	2005	Six plants, at risk
	Rare or threatened	Critically Endangered	<i>Juncus australis</i>	2005	Dangerously few
	Rare or threatened	Critically Endangered	<i>Geranium</i> ?sp. 14	2005	Scarce, localised
	Rare or threatened	Critically Endangered	<i>Rumex bidens</i>	2004	
	Rare or threatened	Endangered	<i>Eleocharis gracilis</i>	2005	Abundant
	Rare or threatened	Endangered	<i>Myriophyllum crispatum</i>	2005	2 patches only
	Rare or threatened	Vulnerable	<i>Juncus usitatus</i>	2005	
	Rare or threatened	Vulnerable	<i>Persicaria prostrata</i>	2005	Numerous
	Rare or threatened	Vulnerable	<i>Urtica incisa</i>	2005	Numerous
	Rare or threatened	Vulnerable	<i>Ricciocarpos natans</i>	2005	
	Rare or threatened	Data Deficient	<i>Calystegia ?sepium</i>	2005	Numerous
	Rare or threatened	Secure	<i>Wolffia australiana</i>	2005	Numerous
	Rare or threatened	Secure	<i>Persicaria subsessilis</i>	2005	Numerous
		Endangered	<i>Carex ?appressa</i>	2005	2 plants only
		Endangered	<i>Lomandra longifolia</i>	2005	Dangerously few
		Endangered	<i>Callistemon sieberi</i> × 10	2005	At risk from erosion
		Endangered	<i>Geranium</i> sp. 5	2005	Numerous
		Endangered	<i>Gynatrix pulchella</i>	2005	See end of table*
		Endangered	<i>Pseudognaphalium luteoalbum</i>	2005	Very scarce
		Vulnerable	<i>Isolepis cernua</i> var. <i>platycarpa</i>	2005	Numerous
		Vulnerable	<i>Juncus pauciflorus</i>	2005	
		Vulnerable	<i>Juncus subsecundus</i>	2005	
		Vulnerable	<i>Phragmites australis</i>	2005	Scarce
		Vulnerable	<i>Typha domingensis</i>	2005	Abundant
		Vulnerable	<i>Acaena novae-zelandiae</i>	2005	Very localised
		Vulnerable	<i>Crassula helmsii</i>	2005	Abundant

* The site's twenty or so wild *Gynatrix pulchella* represent the second-largest population in any site within Boroondara (next to Site 6, the Burke Rd Billabong). This includes the largest specimen, with a trunk girth of 45 cm.

Full flora list

Thirteen lists of plants from different parts of the site are stored in this study's database (lists T05000-T05010 and quadrats N04080 and N04081). These lists are condensed into the three columns in the table below, categorised according to whether the species were found in a wetland, in Floodplain Riparian Woodland, or in turf. In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum (in at least one area); 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found.

Species Name	Wetland	Woodland	Turf	Species Name	Wetland	Woodland	Turf	Species Name	Wetland	Woodland	Turf
Indigenous species				<i>Crassula helmsii</i>	D	M		<i>Juncus subsecundus</i>		✓	
<i>Acacia dealbata</i>		D		<i>Eleocharis gracilis</i>	D			<i>Juncus usitatus</i>		✓	
<i>Acacia implexa</i> *		-		<i>Eleocharis sphacelata</i>	D			<i>Lachnagrostis filiformis</i>	✓		
<i>Acacia melanoxylon</i>		-		<i>Epilobium billardierianum</i>			✓	<i>Lemna disperma</i>	M		
<i>Acaena novae-zelandiae</i>		✓		subsp. <i>cinereum</i>				<i>Lepidium pseudohyssopifolium</i>		-	
<i>Alisma plantago-aquatica</i>	M			<i>Epilobium hirtigerum</i>	M			<i>Lomandra longifolia</i>		-	
<i>Alternanthera denticulata</i>	M	M		<i>Eucalyptus camaldulensis</i>		D		<i>Lunularia cruciata</i>		-	
<i>Austroanthonia fulva</i>		-		<i>Geranium</i> ?sp. 14				<i>Lythrum hyssopifolia</i>	✓		
<i>Austroanthonia racemosa</i>		-		<i>Geranium</i> sp. 5		M		<i>Melaleuca ericifolia</i>	✓		
<i>Azolla filiculoides</i>	✓			<i>Geranium</i> sp.	-	✓		<i>Melicytus dentatus</i>		D	
<i>Callistemon sieberi</i>		✓		<i>Gynatrix pulchella</i>		✓		<i>Microlaena stipoides</i>		-	
<i>Callitriche</i> ? sp.		-		<i>Isolepis cernua platycarpa</i>		M		<i>Muellerina eucalyptoides</i>		✓	
<i>Calystegia ?sepium</i>		M		<i>Juncus amabilis</i>	D	✓		<i>Myriophyllum crispatum</i>	✓		
<i>Carex ?appressa</i>	-	-		<i>Juncus australis</i>		-		<i>Oxalis exilis/perennans</i>		✓	M
<i>Cassinia arcuata</i>		-		<i>Juncus gregiflorus</i>	✓			<i>Persicaria decipiens</i>	D	M	
<i>Coprosma quadrifida</i>		✓		<i>Juncus pauciflorus</i>		✓		<i>Persicaria lapathifolia</i>	✓	M	
				<i>Juncus sarophorus</i>	✓	✓					

Species Name	Wetland	Woodland	Turf	Species Name	Wetland	Woodland	Turf	Species Name	Wetland	Woodland	Turf
<i>Persicaria prostrata</i>	M			<i>Cyperus eragrostis</i>		M		<i>Prunus cerasifera</i>			✓
<i>Persicaria subsessilis</i>	M	M		<i>Dactylis glomerata</i>				<i>Ranunculus repens</i>	✓	✓	
<i>Phragmites australis</i>		✓		<i>Echinochloa crus-galli</i>				<i>Raphanus raphanistrum</i>			
<i>Portulaca oleracea</i>		✓		<i>Echinochloa esculenta</i>				<i>Rorippa palustris</i>	M	M	
<i>Pseudognaphalium luteo-album</i>	-			<i>Ehrharta erecta</i>		✓		<i>Rosa rubiginosa</i>			
<i>Ricciocarpos natans</i>	✓			<i>Eragrostis mexicana</i>				<i>Rubus ?anglocandicans</i>		✓	
<i>Rumex bidens</i>	-			<i>Foeniculum vulgare</i>		✓		<i>Rumex conglomeratus</i>		M	
<i>Triglochin procera</i>	M			<i>Fraxinus angustifolia</i>		M		<i>Rumex ?pulcher</i>		M	
<i>Typha domingensis</i>	D			<i>Fumaria</i> sp.		✓		<i>Salix babylonica</i>		M	
<i>Urtica incisa</i>		M		<i>Galium aparine</i>		✓		<i>Salix ?fragilis</i>		✓	
<i>Wolffia australiana</i>	M			<i>Helminthotheca echioides</i>				<i>Salix matsudana</i> 'Tortuosa'	-	-	
Weed species				<i>Holcus lanatus</i>				<i>Salix</i> sp.	✓	✓	
<i>Acer negundo</i>		✓		<i>Hypochoeris radicata</i>		✓		<i>Salix</i> × <i>sepulcralis</i> var. <i>chrysocoma</i>		✓	
<i>Allium triquetrum</i>		M		<i>Ipomoea indica</i>				<i>Solanum americanum</i>			
<i>Araujia sericifera</i>		✓		<i>Juncus articulatus</i>	✓			<i>Solanum mauritianum</i>		✓	
<i>Arundo donax</i>				<i>Ligustrum lucidum</i>				<i>Solanum nigrum</i>		✓	
<i>Aster subulatus</i>	M	✓		<i>Lonicera japonica</i>		✓		<i>Solanum pseudocapsicum</i>		M	
<i>Atriplex prostrata</i>	✓	M		<i>Lotus subbiflorus</i>	M			<i>Solidago canadensis</i>		✓	
<i>Bromus catharticus</i>				<i>?Malva</i> sp.				<i>Sonchus oleraceus</i>		✓	
<i>Cirsium vulgare</i>				<i>Mentha ?pulegium</i>				<i>Taraxacum</i> sp.			
<i>Conium maculatum</i>				<i>Modiola caroliniana</i>		M		<i>Tradescantia fluminensis</i>		M	
<i>Conyza sumatrensis</i>				<i>Paspalum dilatatum</i>		✓		<i>Trifolium repens</i>			
<i>Coprosma repens</i>				<i>Paspalum distichum</i>	D			<i>Ulex europaeus</i>		✓	
<i>Cordyline australis</i>		✓		<i>Passiflora caerulea</i>				<i>Ulmus</i> sp.			
<i>Cotoneaster glaucophyllus</i>				<i>Pennisetum clandestinum</i>		M		<i>Verbena bonariensis</i>			
<i>Cotula coronopifolia</i>				<i>Persicaria maculosa</i>	✓	✓		<i>Vinca major</i>		✓	
<i>Crataegus monogyna</i>		M		<i>Phalaris aquatica</i>		✓		<i>Viola odorata</i>		M	
<i>Cynodon dactylon</i>		M		<i>Pittosporum undulatum</i>				<i>Zantedeschia aethiopica</i>			
				<i>Plantago lanceolata</i>							
				<i>Plantago major</i>	M						

Large old trees

In addition to the *Gynatrix pulchella* mentioned on page 77, the site is notable for the presence of twenty-seven identified River Red Gums (*Eucalyptus camaldulensis*) that qualify as large old trees according to the Department of Sustainability & Environment's criterion for Floodplain Riparian Woodland (i.e. trunk diameters of at least 0.8 m). These are circled in yellow on the aerial photograph on p. 74. The maximum diameter was 1.23 m. The trees' health ratings were:

Health Rating:	Very Good	Good	Fair to Good	Fair	Poor
Number of trees:	5	16	4	2	0

Fauna of special significance

The significant fauna species in the list below have been observed at the Freeway Golf Course. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

The species with the highest conservation status is the Grey-headed Flying-fox, represented by one individual seen flying overhead by the author during spotlighting for this study, but such observations can be made across most of Melbourne's eastern suburbs. The record of a Glossy Grass Skink is more significant because the site provides full habitat needs for this species, and there is a substantial chance that the species remains there (despite the passage of fourteen years since the last observation).

Conservation Status				Species Name	Last Record
Australia	Victoria	Melbourne	Boroondara		
Vulnerable	Vulnerable	Rare	Secure	Grey-headed Flying-fox	2004
	Near Threatened	Vulnerable	Critically Endangered	Glossy Grass Skink	1991

Conservation Status				Species Name	Last Record
Australia	Victoria	Melbourne	Boroondara		
	Near Threatened	Vulnerable	Occasional Visitor	Azure Kingfisher	2006
		Vulnerable	Vulnerable	Crested Pigeon	2005
		Near Threatened	Occasional Visitor	Buff-banded Rail	1991
		Rare	Secure	Common Galaxias	1994
			Critically Endangered	Eastern Brown Snake	2003
			Endangered	Striped Marsh Frog	2005
			Endangered	Spotted Marsh Frog	1965
			Endangered	Water Rat	1960
			Endangered	Spotted Pardalote	2005
			Vulnerable	Little Black Cormorant	2005
			Vulnerable	White-faced Heron	2005
			Vulnerable	Yellow-tailed Black-Cockatoo	2005
			Vulnerable	Eastern Rosella	2005
			Vulnerable	Laughing Kookaburra	2005
			Vulnerable	Superb Fairy-wren	2005
			Vulnerable	White-browed Scrubwren	2005
			Vulnerable	New Holland Honeyeater	2005
			Vulnerable	Eastern Spinebill	2005
			Vulnerable	Eastern Yellow Robin	2004
			Vulnerable	Grey Shrike-thrush	2005
			Vulnerable	Grey Fantail	2005
			Vulnerable	Black-faced Cuckoo-shrike	2004
			Occasional Visitor	Australian Pelican	1999
			Occasional Visitor	Cattle Egret	1999
			Occasional Visitor	Common Bronzewing	1999
			Occasional Visitor	Rufous Whistler	2004
			Occasional Visitor	Australian Reed-warbler	2004

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species and obelisks (†) indicate species for which breeding was confirmed.

Butterflies		Mammals		Sulphur-crested Cockatoo	2004
*Cabbage White	2005	Common Ringtail Possum	2005	Rainbow Lorikeet	2005
Common Brown	2005	Grey-headed Flying-fox	2004	Eastern Rosella	2005
Common Grass-blue	2005	Water Rat	1960	Red-rumped Parrot	2005
				Azure Kingfisher	2006
Fish		Birds		Laughing Kookaburra	2005
Common Galaxias	1994	†Australian Wood Duck	2005	Superb Fairy-wren	2005
*Goldfish	1979	†Pacific Black Duck	2005	Spotted Pardalote	2005
*Roach	1994	Chestnut Teal	2005		
Shortfin Eel	1994	Little Black Cormorant	2005	White-browed Scrubwren	2005
*Oriental Weatherloach	1985	Australian Pelican	1999	Brown Thornbill	2005
*Mosquitofish	2005	White-faced Heron	2005	†Red Wattlebird	2005
*Redfin	1979	Cattle Egret	1999	Bell Miner	2004
		Buff-banded Rail	1991	†Noisy Miner	2005
Frogs		†Purple Swampphen	2005	White-plumed Honeyeater	2005
Common Froglet	2005	Dusky Moorhen	2005	New Holland Honeyeater	2005
Southern Bullfrog	1964	Eurasian Coot	2005	Eastern Spinebill	2005
Striped Marsh Frog	2005	Masked Lapwing	2005	Eastern Yellow Robin	2004
Spotted Marsh Frog	1965	Silver Gull	2005	Rufous Whistler	2004
		*Spotted Turtle-Dove	2005	Grey Shrike-thrush	2005
Reptiles		Common Bronzewing	1999	Magpie-lark	2005
Glossy Grass Skink	1991	Crested Pigeon	2005	Grey Fantail	2005
Tiger Snake	2003	Yellow-tailed Black-Cockatoo	2005	†Willie Wagtail	2005
Eastern Brown Snake	2003		2005	Black-faced Cuckoo-shrike	2004
		Long-billed Corella	2004	Grey Butcherbird	2005

†Australian Magpie	2005	Australian Reed-warbler	2004
Little Raven	2005	*Common Blackbird	2005
*Skylark	1991	*Common Starling	2004
Welcome Swallow	2005	*Common Myna	2005

Bird census results

Two twenty-minute bird censuses were carried out as part of the bird survey by David Lockwood on 18/10/04. The first recorded eleven species (including one introduced) and the second recorded twelve species (none introduced). The species with the highest counts per census were Wood Duck (28), Rainbow Lorikeet (12), Red Wattlebird (9), Purple Swamphen (9) and Noisy Miner (8).

Fauna habitat

The corridor of River Red Gums and shrubs along the Yarra River is somewhat protected from human traffic and provides shelter and food for small insectivorous birds as well as nesting sites for various birds and feeding vantage points and a food source for the Laughing Kookaburra. One would expect to find substantial numbers of possums, but only two Common Ringtail Possums were found while making two spotlight traverses along 700 m of river frontage. There are likely to be many bats in the trees along the river, which could not be detected with the survey methods used in this study.

Thirteen Wood Duck fledglings were observed on the Yarra River, suggesting that this species nested in a River Red Gum somewhere in the vicinity. An active Willie Wagtails' nest was observed in a Silver Wattle (*Acacia dealbata*) overhanging the Yarra. The River Red Gums contain a small number of small to medium-sized hollows, but none were observed to be utilised during our daytime surveys.

Vegetation along the Koonung Creek provides less protection from human traffic, but is adequate for the Laughing Kookaburra, Pacific Black Duck and Chestnut Teal to persist along this narrow stretch of water.

The various billabongs and ponds are used as breeding and feeding sites for frogs and wetland birds. Several Chestnut Teal fledglings were seen in a billabong and an Australian Reed-warbler was found in a patch of Cumbungi (*Typha* sp.) emerging from a billabong. The White-faced Heron was observed feeding in the seclusion of vegetation fringing another billabong.

The well-vegetated billabong between the 10th fairway and the Carey Grammar Sports Complex deserves particular comment. It supported three broods of Purple Swamphen and large numbers of frogs during the surveys in 2004-5. The same billabong also supported the rare Glossy Grass Skink when inspected in 1991, and the habitat still appears suitable.

The flowers of various species of planted eucalypts act as a food source for many aggressive Noisy Miners, Red Wattlebirds and Rainbow Lorikeets. Fledglings of both Noisy Miners and Red Wattlebirds were observed, and the latter species was found nesting in a planted *Melaleuca*. A New Holland Honeyeater was also observed feeding on the flowers of a small eucalypt, not frequented by such aggressive birds at the time of the survey. The River Red Gums were not flowering at the time of the bird survey, otherwise there might not have been so many small to medium sized insectivorous birds such as the Rufous Whistler, Grey Shrike Thrush, Grey Fantail and Brown Thornbill.

Mown grassy areas of the golf course are frequented by birds such as Crested Pigeons, Wood Duck, Magpie-lark and the introduced Common Starling.

The high voltage transmission pylons provide potential roosting sites for the Australian Hobby but none was observed.

Site significance ratings

The following is an assessment of the site's significance against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to this site.

BioSites criterion 1.1.2 attributes **Local** significance to 'Areas of 100 ha or more of contiguous native vegetation in a heavily fragmented landscape', which applies to the corridor of vegetation along the banks of the Yarra River (extending upstream and downstream of this site).

BioSites criterion 1.2.6 attributes **Regional** significance to links of regional-scale ecological corridors, which applies to this site because its vegetation and wetlands represent a component of the Yarra River corridor.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), even quite degraded native vegetation belonging to an endangered EVC (including both EVCs on this site) has a conservation

significance rating of High. The conservation significance rises to Very High where the habitat score is at least 40% within an area of an endangered EVC, and the habitat score for part of this site was found to be 61%.

According to BioSites criterion 3.2.3, **State** significance applies to any site with a 'remnant patch' whose conservation significance is High or Very High due to the presence of a threatened EVC. This applies to the present site, noting that the size and native understorey cover of the area with a habitat score of 61% easily meets any reasonable definition of a remnant patch.

Rare or threatened plants

The site has a small population (six known plants) of *Lepidium pseudohyssopifolium*, which is listed by DSE (2005a) as suspected (but not confirmed) to be rare or threatened. BioSites criterion 3.1.2 attributes **Regional** significance to such a site, taking into account that the species is not endemic to Victoria.

The site also supports twenty-two other species of plants that are threatened in Boroondara, including a large, thriving patch of *Eleocharis gracilis* (which is unique in Boroondara and rare throughout the Melbourne area). Each one of the species with viable populations gives the site **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

The site supports viable populations of several fauna species that are threatened in Boroondara, including the Glossy Grass Skink, Eastern Brown Snake, Striped Marsh Frog and Spotted Marsh Frog. Each of these gives the site **Local** significance according to BioSites criterion 3.1.5.

It could also be argued that a confirmed, viable population of the Glossy Grass Skink would be of Regional significance. That species is listed by DSE (2003) as 'near threatened', a category which seems to have been overlooked in BioSites criteria 3.1.2 and 3.1.3 (noting that the lower threat category, 'rare', does lead to a significance rating).

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds, particularly low ones smothering the ground flora and woody weeds out-competing indigenous shrubs and small trees. The species of concern are: <ul style="list-style-type: none"> • Very serious: Wandering Jew (<i>Tradescantia fluminensis</i>) • Serious: Box Elder (<i>Acer negundo</i>), Hastate Orache (<i>Atriplex prostrata</i>), Hawthorn (<i>Crataegus monogyna</i>), Couch (<i>Cynodon dactylon</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Hairy Bird's-foot Trefoil (<i>Lotus suaveolens</i>), Carolina Mallow (<i>Modiola caroliniana</i>), Water Couch (<i>Paspalum distichum</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Yellow Marsh-cress (<i>Rorippa palustris</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Weeping Willow (<i>Salix babylonica</i>), Willows (<i>Salix</i> spp.), Tobacco-bush (<i>Solanum mauritianum</i>), Madeira Winter-cherry (<i>Solanum pseudocapsicum</i>), Gorse (<i>Ulex europaeus</i>). 	All	Moderate	Current
Mowing or herbicide use inadvertently destroying <i>Lepidium pseudohyssopifolium</i> between the 13th fairway and the billabong to the east (around MGA coordinates 330100, 5817070).	<i>Lepidium pseudohyssopifolium</i>	Moderate	Potential
Eucalypt dieback disease due to psyllids and/or leaf skeletonisers. This threat appears to have been a problem previously and is likely to recur from time to time.	Floodplain Riparian Woodland; Hollow-bearing trees; Wildlife corridor	Low	Potential
Borer attack of Silver Wattles (<i>Acacia dealbata</i>).	Floodplain Riparian Woodland	Low	Current

Threat	Natural assets affected	Severity	When?
Populations of the aggressive Noisy Miner and Red Wattlebird are out of ecological balance and are evicting birds such as small insectivores. This, in turn, represents a threat to the health of the River Red Gums.	Floodplain Riparian Woodland; birdlife	Moderate	Current
Predation by foxes and cats. The remains of a bird killed by a fox or cat was found.	Fauna	Low	Current
Precariously small numbers of <i>Acacia melanoxylon</i> , <i>Carex appressa</i> , <i>Coprosma quadrifida</i> , <i>Lomandra longifolia</i> , <i>Geranium</i> ?sp. 14 and <i>Lepidium pseudohyssopifolium</i> , causing vulnerability to inbreeding or chance events.	The species listed	Moderate	Potential
Soil erosion of the banks of the Yarra River during flood.	Floodplain Riparian Woodland; <i>Callistemon sieberi</i>	Moderate	Any major flood
Soil erosion causing silting and consequent dredging of wetlands (particularly next to the 6th fairway).	Floodplain Wetland Complex	Low	Potential
Nutrient addition to soil and water in natural habitats, from the golf course and abutting sports complex.	Both EVCs	Low	Potential

Past management and revegetation

Blackberry has been significantly reduced recently by a program of herbicide spraying along the Yarra River downstream of Koonung Creek. Blackberry has also been kept under control along Koonung Creek, but not along the Yarra River upstream of Koonung Creek.

Past plantings in the golf course have been with Australian native species rather than locally indigenous species.

The southernmost wetland (pond), beside the 6th fairway, had accumulated so much silt by about 1997 that it was dredged. The current course manager, who started working at the course two years later, believes that there was no planting of the pond following the dredging. The abundance of the regionally rare plant species, *Eleocharis gracilis*, around the pond's perimeter shows its robustness to dredging and mowing. However, some other significant plant species such as *Myriophyllum crispatum* are absent from parts of the pond where the effects of dredging are still apparent.

Priority actions

1. Urgently control blackberry and Tobacco-bush along the Yarra River upstream from Koonung Creek, with great care in the vicinity of rare plants, namely five Hemp Bushes (*Gynatrix pulchella*) near MGA coordinates 329870, 5817110, a *Callistemon sieberi* near 329850, 5817090 and two more *Callistemon sieberi* near 329830, 5817000.
2. Remove the Black Bindweed (*Fallopia convolvulus*) that is smothering the very large Hemp Bush (*Gynatrix pulchella*) that is marked on the aerial photograph near the quadrat on the Yarra River. Remove other weeds surrounding the Hemp Bush, such as blackberry.
3. Conduct intensive weed control (including hand weeding) within the area outlined in yellow on the aerial photograph next to the Yarra River.
4. Plant Swamp Paperbark (*Melaleuca ericifolia*) and River Bottlebrush (*Callistemon sieberi*) wherever practicable along Koonung Creek and at locations around billabongs and ponds – particularly between Koonung Creek and the most northeasterly billabong (north of the clubhouse). Such plantings must not unreasonably obstruct floodwater and should be approved by Melbourne Water. Scattered plantings along the Yarra River would also be desirable. These plantings are to stabilise the stream banks, provide habitat for existing fauna species such as the Glossy Grass Skink and attract additional species such as the Nankeen Night Heron.
5. In conjunction with the planting of Swamp Paperbark and River Bottlebrush, establish a program of progressive removal of tree weeds (particularly Desert Ash, Box Elder and willows) along Koonung Creek downstream of the clubhouse and along the Yarra River downstream from Koonung Creek.
6. If it becomes necessary to remove silt from any of the billabongs, an ecological assessment should first be conducted and a simple environmental management plan should be prepared for the procedure.

Future revegetation

The stability of the banks of both streams would benefit from planting of Swamp Paperbarks (*Melaleuca ericifolia*), whose root system binds soil against the effects of floodwater. River Bottlebrush (*Callistemon sieberi*) would also help, but to a lesser degree. However, the aboveground parts of these species create turbulence and drag in floodwater, so the drainage authority may not want to see them planted extensively. The opportunities for planting these species to stabilise banks and provide habitat should be examined with Melbourne Water. This should be considered in conjunction with a plan for progressive replacement of woody weeds.

Prickly Currant-bush (*Coprosma quadrifida*) and Blackwood (*Acacia melanoxylon*) are unnaturally scarce along both streams, and Tree Everlasting (*Ozothamnus ferrugineus*) is uncharacteristically absent. It would be desirable to plant these species as well as River Tea-tree (*Leptospermum obovatum*) and Snowy Daisy-bush (*Olearia lirata*) along the streams to improve both their conservation status and the habitat for native fauna.

Small turf slabs of *Eleocharis gracilis* should be transplanted from the southernmost wetland (beside the 6th fairway) to each of the other billabongs, to provide greater security for this regionally rare species. It has shown itself to be very practical at the edge of a wetland in this golf course.

To improve the security of another rare species, it would also be desirable to collect and raise seed from each of the six plants of *Lepidium pseudohyssopifolium* around MGA coordinates (330100, 5817070), to be planted in the area outlined in yellow on the aerial photograph. The number of plants planted should be documented to allow future monitoring of survival.

The numbers of *Myriophyllum crispatum* should also be increased above their present small numbers by taking approximately eight cuttings (probably with a small section of rhizome) from the southernmost wetland, and transplanting them in the most northwesterly and northeasterly wetlands.

Some Silver Wattles (*Acacia dealbata*) with weeds beneath them could be selected to create mulched beds planted with the wallaby-grasses *Austrodanthonia fulva*, *A. laevis* and *A. racemosa*. This is to attract ground-dwelling seed-feeding species such as the Common Bronzewing. Wildflowers from the list below could also be planted to add attractiveness. The addition of *Lomandra longifolia* would be desirable to boost this species' unnaturally low numbers on the site and to provide butterfly habitat.

Other species recommended for planting

Carex appressa, *Dianella* species, *Desmodium gunnii*, *Dichondra repens*, *Goodenia ovata*, *Lobelia anceps*, *Lomandra longifolia*, *Pelargonium australe*, *Veronica gracilis*, *V. plebeia*, *Viola hederacea*, *Wahlenbergia communis*.

Records should be kept of any planting done in this (or any other) site, including species, numbers and locations.

Species suitable for collection of seed or cuttings

Acacia dealbata, *Alisma plantago-aquatica*, *Alternanthera denticulata*, *Callistemon sieberi*, *Crassula helmsii*, *Eleocharis gracilis*, *Eleocharis sphacelata*, *Eucalyptus camaldulensis*, *Gynatrix pulchella*, *Melicytus dentatus*, *Isolepis platycarpa*, *Juncus* species, *Lepidium pseudohyssopifolium* (only small numbers of seed), *Persicaria* species, *Triglochin procera*.

All species of *Persicaria* present on the site are numerous enough to allow substantial seed collection in 2005-6. Some species may diminish in numbers once the regenerative effect of the February 2005 flood abates.

Monitoring

This study found no pre-existing data suitable for ecological monitoring.

The following items have been gathered to provide a baseline for future monitoring:

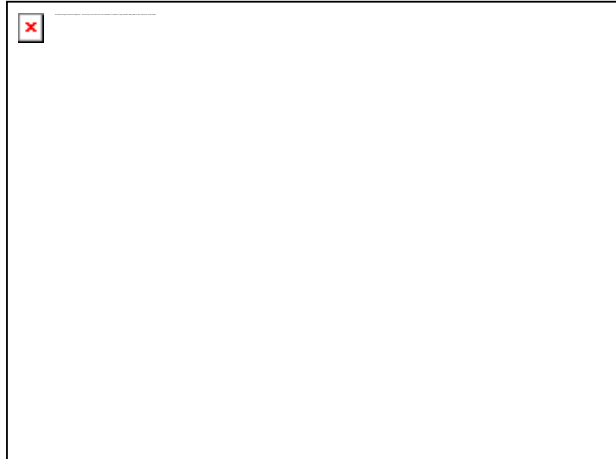
- Photographs as displayed on the next two pages and marked on the aerial photograph, all taken on 3rd-4th March 2005. The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 74. Original digital images are available separately. Repeat the photographs about every two years. Check tree foliage density, the abundance of weeds and structural changes in the vegetation.
- The flora lists for each part of the site, stored in the database of this study. This includes abundance measures and severity ratings for weed species.
- The habitat zone and quadrat N04080, as marked on the aerial photograph. The original field data sheets are available separately and the quadrat data is being offered to the Department of Sustainability & Environment. Repeat every two to four years. Check the abundance of weeds, structural changes in vegetation, changes in habitat score and the species present.
- Tree health ratings, as stored in the geographic information system data from this study and summarised above.
- Population sizes of scarce plant species: *Callistemon sieberi* (2 on Koonung Creek and 8 on the Yarra, equally spread north and south of the confluence with Koonung Creek); *Lepidium pseudohyssopifolium* (six individuals around MGA

coordinates 330100, 5817070); and *Myriophyllum crispatum* (two patches, one several metres each side of the bridge over the pond beside the 6th fairway).

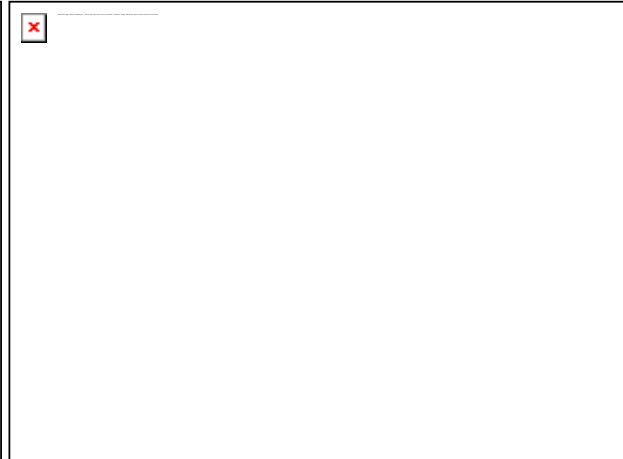
- Bird survey, including the two twenty-minute bird censuses. Repeat in spring every two to four years. Check for changes in abundance of birds or the species present.

Monitoring photographs for the Freeway Golf Course, taken on 3rd-4th March 2005

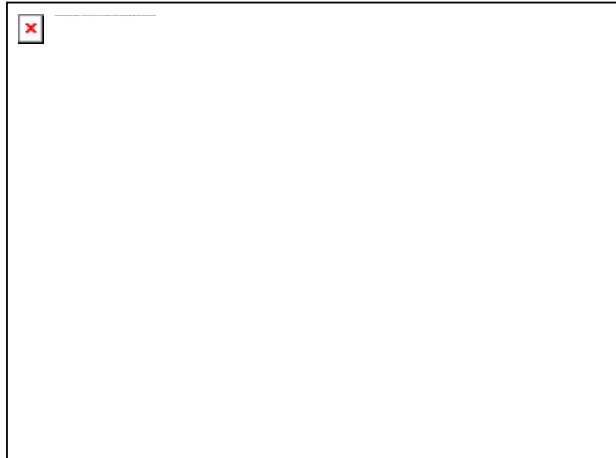
The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 74.



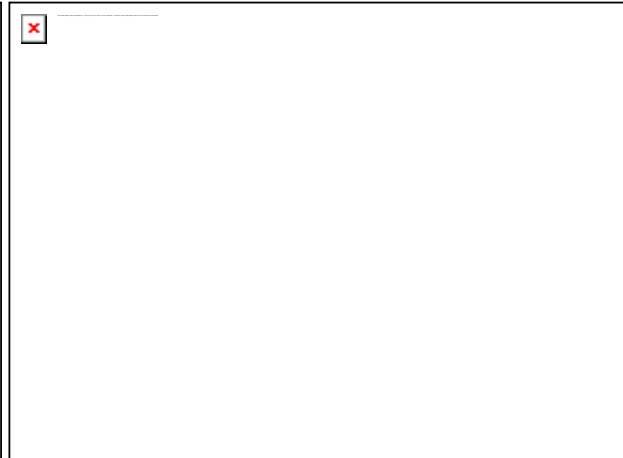
Site 4, Photo 1. The pond beside the 6th fairway of the Freeway Golf Course, viewed toward the east to show the coverage of vegetation.



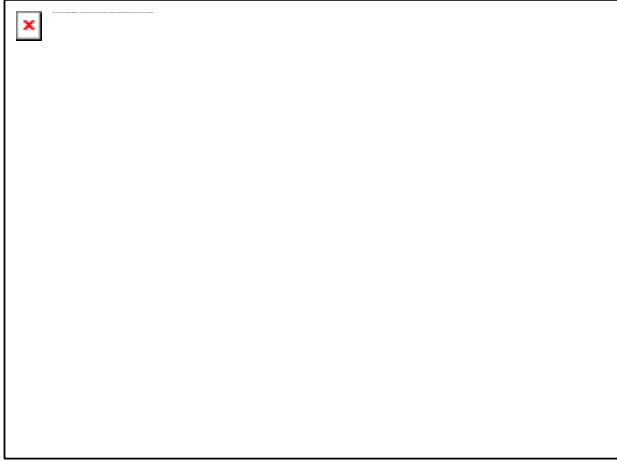
Site 4, Photo 2. Close-up of the southwest corner of the pond in Photo 1, looking east. *Alisma*, *Crassula*, *Persicaria decipiens*, *Typha* and the weed *Paspalum distichum* are visible. *Eleocharis gracilis* is present but hidden.



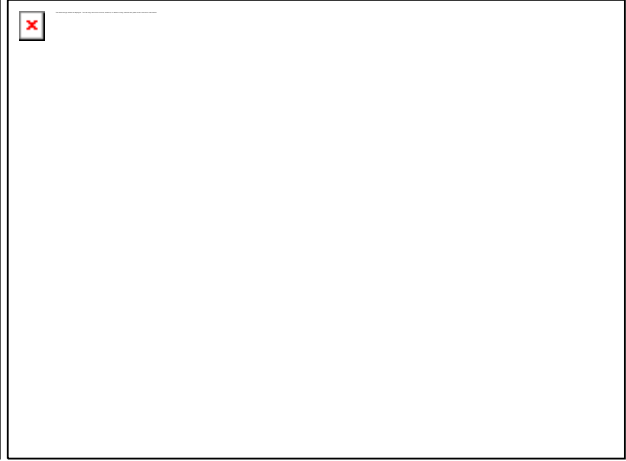
Site 4, Photo 3. Looking south over the southern part of the most northeasterly billabong, showing vegetation coverage.



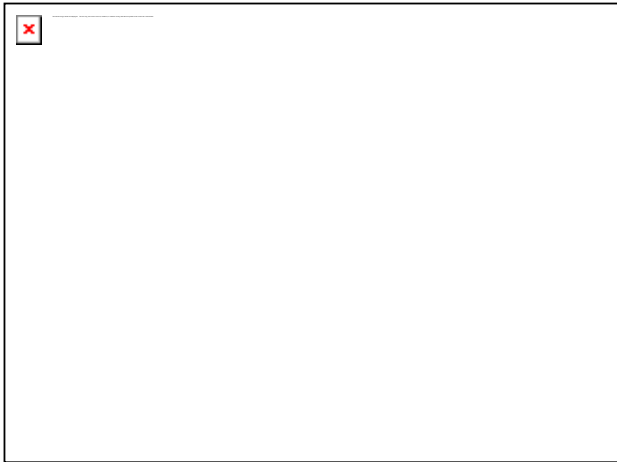
Site 4, Photo 4. Looking southeast over the most northeasterly billabong, from the end of a sand trap beside the 10th green, to show vegetation coverage.



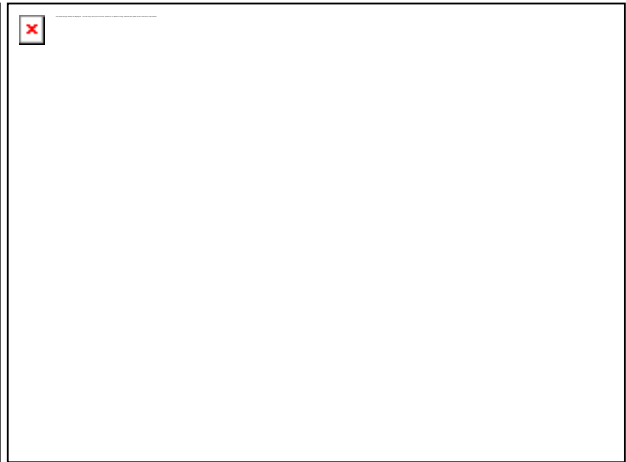
Site 4, Photo 5. Looking northwest along the billabong east of the 13th fairway, to show fringing vegetation and the luxuriance of the tree crowns.



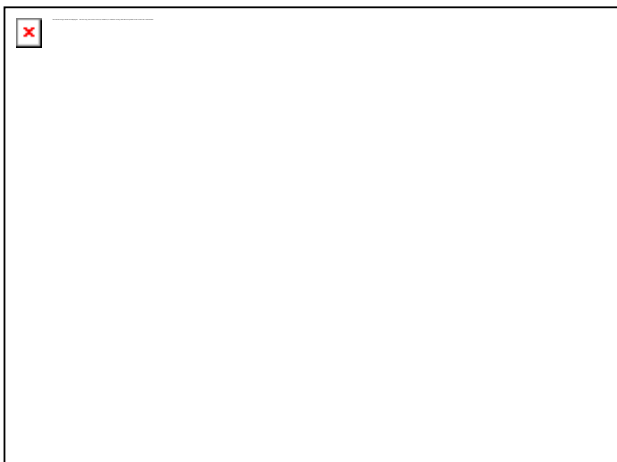
Site 4, Photo 6. Looking south over the western third of the most northwesterly wetland. Note the docks and Kikuyu Grass impinging on the pond, where many *Pericarias* can be seen (among them, many *Pericaria prostrata*).



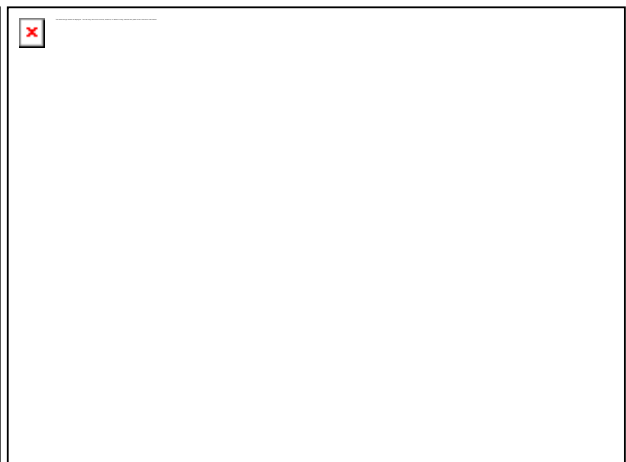
Site 4, Photo 7. Looking southeast along the edge of the Yarra River within the habitat scoring zone, to show luxuriant growth of *Urtica incisa*, *Calystegia sepium*, *Pericaria sessilis*, *P. lapathifolia* and *P. decipiens*.



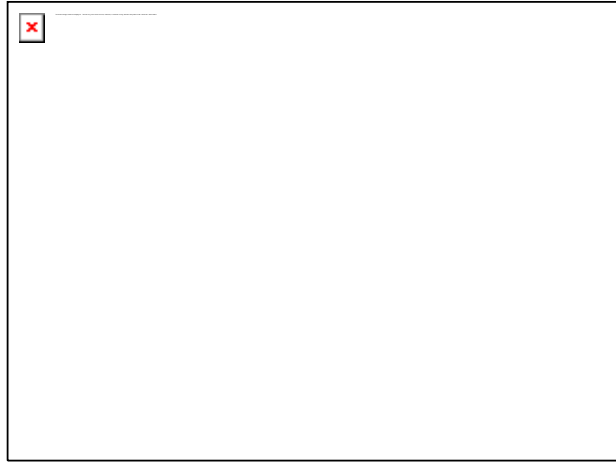
Site 4, Photo 8. Looking south along the river from MGA coordinates 329826,5816600 (approximately). Note the generally good condition of the eucalypt crowns, typical of the Yarra banks within the Freeway Golf Course.



Site 4, Photo 9. Looking south into quadrat N04080 from its northern tip, to show vegetation structure reflecting vigorous regrowth following a flood in February 2005.



Site 4, Photo 10. Looking northwest from the right-angled corner of quadrat N04080, with the right-hand side being one edge of the quadrat. Note the ground recently covered by silt.



Site 4, Photo 11. Looking west from the right-angled corner of quadrat N04080, overlapping phot 10 on the left hand side.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for two full days on 3rd-4th March 2005 using this study's standard approach described in Section 2.3. This included:
 - Description of the structural and floristic composition of each type of native vegetation;
 - Compilation of lists of indigenous and introduced plant species in each of thirteen parts of the site, including the species' abundances and the threat level of all weed species in each area;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally, and similarly for localised infestations of serious weeds;
 - Assessment of habitat score;
 - Assessment of one flora quadrat;
 - Individual assessment of all large old trees;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- A daytime bird survey of the whole site by David Lockwood on 18/10/04 according to the protocol discussed in Section 2.4.1, including two twenty-minute bird censuses;
- One spotlighting session on 25/11/04, including the playing of taped owl calls to attract other owls;
- Data from the Department of Sustainability & Environment's flora and fauna databases;
- Additional information about rare flora and fauna from Cam Beardsell;
- Verbal information about how the site's vegetation has been managed, from the course manager, Glen Davie;
- Recollections of the area in the 1940s to 1960s told to the author by ornithologist Fred T.H. Smith;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

It would be desirable to investigate whether the Glossy Grass Skink persists on the site. If this is confirmed to be true or probable, advice should be taken about how to conserve this rare species.

A survey of frogs in the various water bodies would be desirable in spring. The billabong between the 10th fairway and the Carey Grammar Sports Complex should be checked for the nationally threatened Warty Bell Frog (or Growling Grass Frog) in hot summer weather.

That billabong was too full of water during the vegetation and habitat survey to allow thorough inspection, because of record floods. It deserves a detailed botanical survey (including establishment of a quadrat) in a drier summer. A specimen of a geranium from there was identified by expert Lynlee Smith to be the rare species, *Geranium* sp. 14, with 75% confidence, and Cam Beardsell reports the regionally threatened *Rumex brownii* from the same billabong. This billabong is

all that is left of what was arguably the richest wetland complex in the Melbourne area before construction of the adjacent Carey Grammar Sports Complex some decades ago, according to the recollections of ornithologist, Fred T.H. Smith.

Acknowledgment

Thanks to the golf course manager, Glen Davie, for providing management information and facilitating the site inspections.

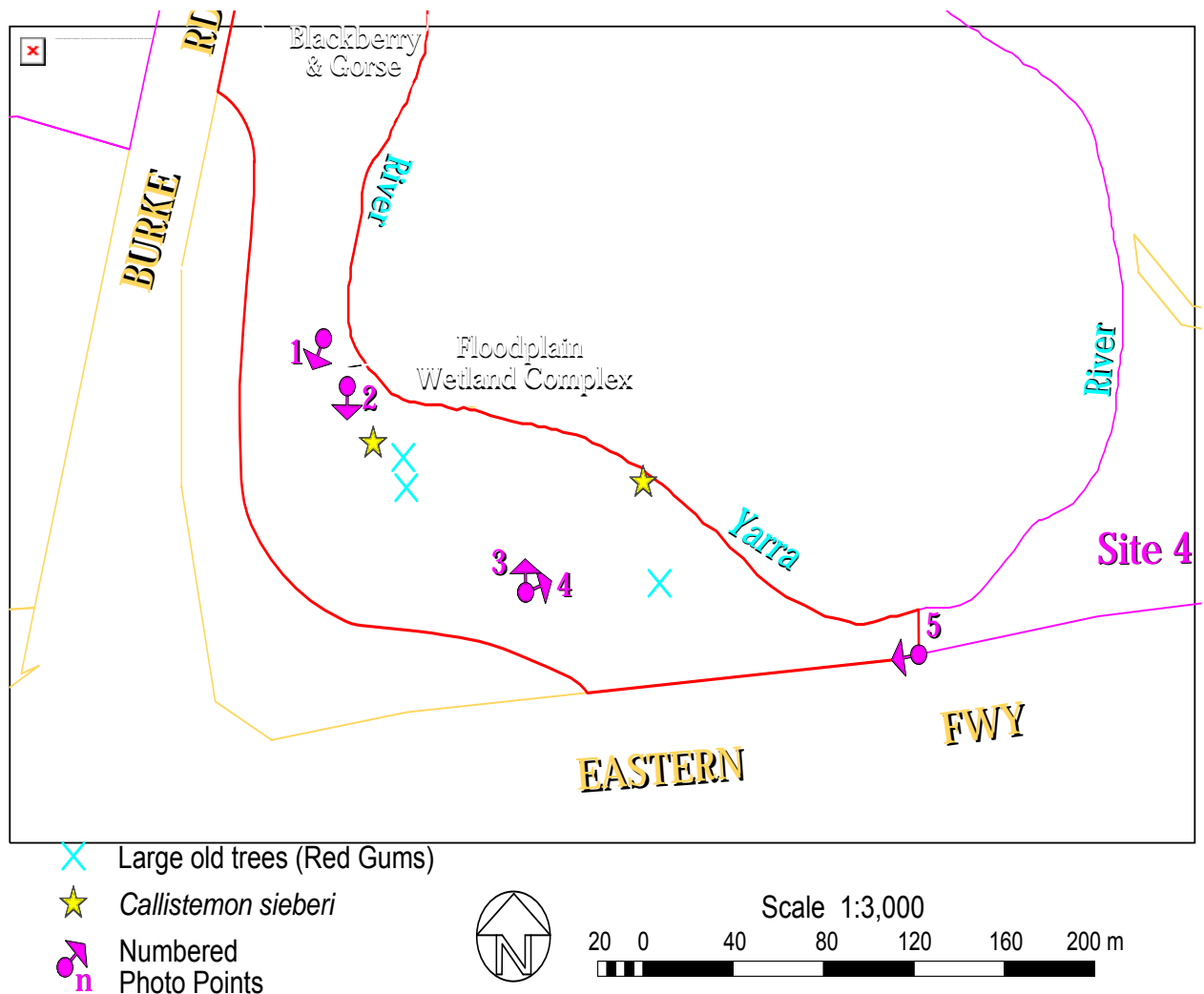
Site 5. Yarra Flats, Balwyn North

Parkland in a narrow strip along the Yarra River, immediately upstream of Burke Rd. Melway ref. 32 A12.

Site Biological Significance Level: *State*

Summary of significant natural assets

- There is a substantial area of the endangered Ecological Vegetation Class (EVC), Floodplain Riparian Woodland, and a small, burgeoning wetland with vegetation belonging to another endangered EVC, Floodplain Wetland Complex;
- There are viable populations of numerous species of flora and fauna that are threatened in Boroondara or the greater Melbourne area, including Platypus;
- The site is part of a major ecological corridor along the Yarra River;
- There are four large old River Red Gums, in good health on average.



Boundaries

This site of biological significance is outlined in red on the aerial photograph. Most of the boundary is formed by the shared bicycle/foot path and the municipal border along the Yarra River, both of which extend east to a fence into the Freeway Golf Course. The straight-line boundary segments beside the freeway and the Burke Rd bridge are cadastral boundaries.

Land use & tenure: Council reserve, used for passive recreation, nature conservation and unpowered transport. Land use changes are strongly limited by land zoning and planning overlays.

Physical features

Site area: 2.9 hectares

Elevation: 6-12 m

Landform: Floodplain and riverbank.

Slope: Land surrounding the river is generally flat, sloping down sharply at the banks of the river.

Soil type: Alluvial deposits washed down by the river, and possibly some older deposits from the ancient lake that once covered the area from Chandler Highway to Templestowe.

Underlying geology: Far below the surface, there is Silurian sedimentary rock of the Andersons Creek formation, but this does not influence the natural features of the site.

Site description

This site contains a gallery of River Red Gums (*Eucalyptus camaldulensis*) and native understorey along the Yarra River between the Freeway Golf Course (Site 4) and the Burke Rd bridge. The gallery's average width is approximately 30 m, but it is interrupted by a swathe beneath electricity transmission lines (seen clearly on the aerial photograph). Where there once were trees in the swathe, there is now a shallow depression that has been recently scraped bare but is regenerating into predominantly native wetland vegetation.

The northern section of the site, where the river bends, was apparently once a popular spot for swimmers. Today, it has become overrun by the declared noxious weeds, blackberry and gorse, as marked on the aerial photograph. The rest of the forest in the site is not so overrun, but most of it is still substantially affected by the serious environmental weeds, Box Elder (*Acer negundo*), White Bladder-flower (or Cruel Vine, *Araujia sericifera*), Hawthorn (*Crataegus monogyna*), willows (*Salix* spp.) and Wandering Jew (*Tradescantia fluminensis*). Nevertheless, the forest and riverbank retain some excellent large River Red Gums as well as populations of at least eight plant species that are threatened in Boroondara or the entire Melbourne area.

One of the highlights of this site is the presence of a low-level terrace beside the river, approximately two metres below the elevation of the floodplain generally, with a particularly high density of locally threatened plants. On the aerial photograph, this terrace lies immediately south of the label, 'Floodplain Wetland Complex'. Because this area is lower than most of the floodplain, flooding is more frequent and turbulent. This results in more thorough scouring of vegetation and greater regeneration of indigenous plants. The author visited the site on 8th March 2005, one month after a record flood, and found few weeds in the ground flora (unlike the floodplain generally) and an abundance of indigenous herbs such as *Urtica incisa* and species of *Juncus* and *Persicaria*. The shrub layer is also particularly mature at the eastern end of the terrace, with many uncommonly large specimens of *Melicytus dentatus* (= *Hymenanthera dentata*) and *Coprosma quadrifida*.

Despite the importance of this terrace, parts of it are infested with Box Elder and willows, particularly at the western end. Removal of the weeds should be a high priority.

Another highlight of the site is the burgeoning wetland vegetation in the depression beneath the electricity transmission lines. Contour maps show that a depression has existed there for many years but the vegetation comprises only young regrowth, as shown in Photo 1 below.



Site 5, Photo 1. The site's wetland, viewed toward the south with the Burke Rd bridge over the Eastern Freeway in the background. Note the young regrowth, which is predominantly of indigenous plants. The reddish, prostrate plants in the foreground are *Alternanthera denticulata*, among many plants of *Persicaria subsessilis*, *Persicaria prostrata* and *Rumex crispus*. Not quite visible in the photograph are numerous small plants of *Triglochin procera* in the water.

The species of plants that are regenerating in the wetland, and the position of the wetland in the landscape, indicate that the wetland vegetation belongs to the endangered Ecological Vegetation Class (EVC), Floodplain Wetland Complex. The wetland is developing into a quite natural representation of this EVC, with only minor weed invasion. It would be desirable to foster this development and prevent weed invasion or other damage. There is potential for damage to the wetland during vegetation management to provide the required clearance for the electricity transmission lines.

Ecological links with other land

This site is on the regionally important Yarra River ecological corridor. Fauna, pollen, seeds and other plant propagules can move fairly freely between this site and nearby sites along both sides of the river, including the Freeway Golf Course (Site 4) immediately upstream (east), the Burke Road Billabong area (Site 6) immediately downstream and the Yarra Flats parklands on the opposite side of the river (in the municipality of Banyule).

Habitat types

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion)

Comprises the whole of the site's treed area, visible on the aerial photograph. 20 indigenous plant species were found.

Canopy trees: *Eucalyptus camaldulensis*, to nearly one metre trunk diameter, with crowns overlapping.

Lower trees: *Acacia dealbata* is fairly dense. *Acacia melanoxylon* and *Melaleuca ericifolia* would have been present once and are still found just upstream of this site, but no longer survive within the site. The weed trees, Box Elder (*Acer negundo*) and willows (*Salix* species) are fairly abundant.

Shrubs: There is a dense shrub layer, typically 3 m tall. *Meliclytus dentatus* (= *Hymenanchera dentata*) is rather dense and *Coprosma quadrifida* is fairly common. *Callistemon sieberi* is at two locations marked on the aerial photograph, with possibly two plants at the more easterly location. There are two plants of *Gynatrix pulchella* and a single *Goodenia ovata*. The somewhat herbaceous shrub, *Persicaria lapathifolia*, is present in small numbers on the slope of the river channel. The shrub weed, Hawthorn (*Crataegus monogyna*), is scattered across the site. Gorse (*Ulex europaeus*) and blackberry (*Rubus ?anglocandicans*) are the dominant understorey species in the northwest, as marked with a dashed white line on the aerial photograph.

Vines: Abundant. At the time of the fieldwork (March 2005), the *Calystegia sepium/silvatica* complex was extremely abundant along the Yarra River, smothering shrubs and ground cover in the wake of the record flood one month earlier. The exotic climber, *Araujia sericifera*, is also abundant.

Ferns: None.

Ground flora: Indigenous ground flora have been mostly displaced by weeds (particularly Wandering Jew, *Tradescantia fluminensis*) except in the wettest parts of the site. The remaining indigenous plants that are present in reasonable numbers are *Alternanthera denticulata*, *Juncus amabilis*, *Juncus usitatus*, *Persicaria decipiens*, *Persicaria subsessilis* and *Urtica incisa*. The characteristic species *Phragmites australis* is present but scarce.

Floodplain Wetland Complex (EVC 172, **regionally Endangered**)

Represented by the shallow depression directly beneath the electricity transmission lines, as marked on the aerial photograph. 8 indigenous plant species were found.

Dominant species: There are two sapling *Eucalyptus camaldulensis* and one *Acacia dealbata*, all approximately 2m tall. *Alternanthera denticulata* is dominant in vegetative cover. *Persicaria prostrata* and *Triglochin procera* are abundant. There is a substantial patch of *Persicaria subsessilis*. A few plants of *Juncus subsecundus* are the only representatives of their genus, but more will no doubt appear as the vegetation matures.

Flora of special significance

The conservation status ratings below (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Last Record	Notes
Melbourne	Boroondara			
Rare or threatened	Vulnerable	<i>Juncus usitatus</i>	2005	Scattered
Rare or threatened	Vulnerable	<i>Persicaria prostrata</i>	2005	Numerous, mainly in the wetland
Rare or threatened	Vulnerable	<i>Urtica incisa</i>	2005	40 were counted
Rare or threatened	Data Deficient	<i>Calystegia ?sepium</i>	2005	Abundant
Rare or threatened	Secure	<i>Persicaria subsessilis</i>	2005	Moderate numbers
	Endangered	<i>Callistemon sieberi</i>	2005	2 or 3 individuals
	Endangered	<i>Gynatrix pulchella</i>	2005	2 individuals
	Vulnerable	<i>Juncus subsecundus</i>	2005	At most several
	Vulnerable	<i>Phragmites australis</i>	2005	Very scant, beside the river
	Vulnerable	<i>Goodenia ovata</i>	2005	A solitary plant near the bridge

The question mark in the entry above for *Calystegia ?sepium* is because the abundant plants of this genus probably represent a spectrum of hybrids, with some plants closer to the indigenous *C. sepium* and others closer to the introduced *C. silvatica*. Two specimens have been lodged with the National Herbarium of Victoria for their determination.

Full flora list

The following table includes all species found at the site during this study, categorised according to whether they were found in the wetland (labelled 'Floodplain Wetland Complex' on the aerial photograph) or in the Floodplain Riparian Woodland. In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found.

Species Name	Wetland	Woodland	Species Name	Wetland	Woodland	Species Name	Wetland	Woodland
Indigenous species			Introduced species			Introduced species (cont.)		
<i>Acacia dealbata</i>		D	<i>Acer negundo</i>		M	<i>Paspalum dilatatum</i>		-
<i>Alternanthera denticulata</i>	D	M	<i>Alstroemeria ?aurea</i>		-	<i>Pennisetum clandestinum</i>	-	✓
<i>Callistemon sieberi</i>		-	<i>Araujia sericifera</i>		M	<i>Persicaria maculosa</i>	-	-
<i>Calystegia ?sepium</i>		D	<i>Aster subulatus</i>		-	<i>Phalaris aquatica</i>		-
<i>Coprosma quadrifida</i>		✓	<i>Atriplex prostrata</i>		✓	<i>Pittosporum undulatum</i>		-
<i>Cotula australis</i>		-	<i>Bromus catharticus</i>		-	<i>Polygonum aviculare</i>	✓	
<i>Eucalyptus camaldulensis</i>	✓	D	<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>		-	<i>Prunus cerasifera</i>		-
<i>Goodenia ovata</i>		-	<i>Cirsium vulgare</i>		-	<i>Quercus robur</i>		-
<i>Gynatrix pulchella</i>		-	<i>Conium maculatum</i>		-	<i>Ranunculus repens</i>		-
<i>Juncus amabilis</i>		M	<i>Conyza sumatrensis</i>		-	<i>Raphanus raphanistrum</i>		-
<i>Juncus ?gregiflorus</i>		-	<i>Crataegus monogyna</i>		✓	<i>Rorippa palustris</i>	✓	✓
<i>Juncus subsecundus</i>	-		<i>Cynodon dactylon</i>	-	✓	<i>Rubus ?anglocandicans</i>		D
<i>Juncus usitatus</i>		✓	<i>Cyperus eragrostis</i>	✓	✓	<i>Rumex conglomeratus</i>	✓	✓
<i>Melicytus dentatus</i>		D	<i>Dactylis glomerata</i>		-	<i>Rumex crispus</i>	✓	✓
<i>Persicaria decipiens</i>		✓	<i>Ehrharta erecta</i>		✓	<i>Salix ?fragilis</i>		✓
<i>Persicaria lapathifolia</i>	-	✓	<i>Fallopia ?convolvulus</i>		✓	<i>Solanum americanum</i>		-
<i>Persicaria prostrata</i>	M	-	<i>Foeniculum vulgare</i>		✓	<i>Solanum mauritianum</i>		✓
<i>Persicaria subsessilis</i>	✓	✓	<i>Fraxinus angustifolia</i>		-	<i>Solanum nigrum</i>		✓
<i>Phragmites australis</i>		-	<i>Fumaria</i> spp.		✓	<i>Solanum pseudocapsicum</i>		✓
<i>Portulaca oleracea</i>	✓	✓	<i>Galium aparine</i>		✓	<i>Sollya heterophylla</i>		-
<i>Triglochin procera</i>	M		<i>Helminthotheca echioides</i>		✓	<i>Sonchus oleraceus</i>		-
<i>Urtica incisa</i>		✓	<i>Iris pseudacorus</i>		-	<i>Taraxacum</i> sp.		-
22 indigenous species			<i>Ligustrum lucidum</i>		-	<i>Tradescantia fluminensis</i>		M
			<i>Lycium ferocissimum</i>		-	<i>Ulex europaeus</i>		M
			<i>Modiola ?caroliniana</i>		-	<i>Ulmus</i> sp.		✓
						<i>Vicia ?hirsuta</i>		-

Large old trees

The site has four River Red Gums (*Eucalyptus camaldulensis*) that qualify as large old trees according to the Department of Sustainability & Environment's criterion for Floodplain Riparian Woodland (i.e. trunk diameters of at least 0.8 m). These are marked with cyan crosses on the aerial photograph on p. 88.

The northernmost of these four trees was so surrounded by blackberry and gorse that no measurements could be taken. It could be seen from the opposite bank of the river that its health is very good.

The two more centrally located large old trees both have trunks measuring 0.81 m diameter. The more northerly one was in fair health and the other was in fair to good health. The latter has hollows suitable for wildlife, and possibly the former, also.

The remaining large old tree, toward the southeast of the site, has a trunk diameter of 0.94 m and is in good health.

Fauna of special significance

The conservation status ratings below (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Last Record
Melbourne	Boroondara		
Near Threatened	Endangered	Platypus	2005
Near Threatened	Occasional Visitor	Bassian Thrush	1997
	Endangered	Yellow-rumped Thornbill	2004
	Vulnerable	Yellow-tailed Black-Cockatoo	1995
	Vulnerable	Tawny Frogmouth	2004
	Vulnerable	Superb Fairy-wren	2005
	Vulnerable	White-browed Scrubwren	2005
	Vulnerable	New Holland Honeyeater	2005
	Vulnerable	Eastern Spinebill	2005
	Vulnerable	Grey Shrike-thrush	2005
	Vulnerable	Grey Fantail	2005

Full fauna list

The following list was compiled during the three hours and forty minutes of fieldwork in March 2005, augmented by a 1995 record of Yellow-tailed Black-Cockatoo. The only introduced species is the Common Blackbird, marked with an asterisk.

Butterflies	Birds	Birds (continued)
Yellow-banded Dart	Pacific Black Duck	Bell Miner
	Dusky Moorhen	Noisy Miner
Reptiles	Yellow-tailed Black-Cockatoo	New Holland Honeyeater
Tiger Snake	Sulphur-crested Cockatoo	Eastern Spinebill
	Tawny Frogmouth	Grey Shrike-thrush
Mammals	Superb Fairy-wren	Grey Fantail
Platypus	White-browed Scrubwren	Willie Wagtail
Common Brushtail Possum	Brown Thornbill	Grey Butcherbird
Common Ringtail Possum	Yellow-rumped Thornbill	*Common Blackbird

Site significance rating

The following is an assessment of the site's significance against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to this site.

BioSites criterion 1.1.2 attributes **Local** significance to 'Areas of 100 ha or more of contiguous native vegetation in a heavily fragmented landscape', which applies to the corridor of vegetation along the banks of the Yarra River (extending upstream and downstream of this site).

BioSites criterion 1.2.6 attributes **Regional** significance to links of regional-scale ecological corridors, which applies to this site because its vegetation represents a component of the Yarra River corridor.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), any native vegetation belonging to an endangered EVC (including both EVCs on this site) has a conservation significance rating of High or Very High. Under BioSites criterion 3.2.3, this translates to **State** significance provided that the vegetation can be deemed a 'remnant patch', and this is true of the Yarra Flats site.

Rare or threatened plants

Ten plant species in this site are threatened in Boroondara, and at least eight of them have viable populations when taken in the context of the contiguous (or almost contiguous) sites along the Yarra River. Each one of the species with viable populations gives the site **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

The site probably forms a small but important part of the habitat of at least one Platypus, given that a platypus was seen there in 2005. The site may also represent a substantial part of the habitat of the Tawny Frogmouth that was found there.

Each of these species is threatened in Boroondara and so the site has **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
<p>Environmental weeds. The species of concern are:</p> <ul style="list-style-type: none"> • Serious: Box Elder (<i>Acer negundo</i>), White Bladder-flower (<i>Araujia sericifera</i>), Hawthorn (<i>Crataegus monogyna</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Crack Willow (<i>Salix ?fragilis</i>), Wandering Jew (<i>Tradescantia fluminensis</i>), Gorse (<i>Ulex europaeus</i>); • Moderately serious: Yellow Alstroemeria (<i>Alstroemeria ?aurea</i>), Hastate Orache (<i>Atriplex prostrata</i>), Prairie Grass (<i>Bromus catharticus</i>), Boneseed (<i>Chrysanthemoides monilifera monilifera</i>), Spear Thistle (<i>Cirsium vulgare</i>), Hemlock (<i>Conium maculatum</i>), Couch (<i>Cynodon dactylon</i>), Drain Flat-sedge (<i>Cyperus eragrostis</i>), Cocksfoot (<i>Dactylis glomerata</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Black Bindweed (<i>Fallopia convolvulus</i>), Fennel (<i>Foeniculum vulgare</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Fumitory (<i>Fumaria</i> sp.), Cleavers (<i>Galium aparine</i>), Ox-tongue (<i>Helminthotheca echioides</i>), Yellow Flag (<i>Iris pseudacorus</i>), Large-leafed Privet (<i>Ligustrum lucidum</i>), African Box-thorn (<i>Lycium ferocissimum</i>), Mallow (?<i>Modiola caroliniana</i>), Paspalum (<i>Paspalum dilatatum</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Toowoomba Canary-grass (<i>Phalaris aquatica</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Prostrate Knotweed (<i>Polygonum aviculare</i>), Cherry-plum (<i>Prunus cerasifera</i>), English Oak (<i>Quercus robur</i>), Creeping Buttercup (<i>Ranunculus repens</i>), Yellow Marsh-cress (<i>Rorippa palustris</i>), Clustered Dock (<i>Rumex conglomeratus</i>), Curled Dock (<i>Rumex crispus</i>), Glossy Nightshade (<i>Solanum americanum</i>), Tobacco-bush (<i>Solanum mauritianum</i>), Black Nightshade (<i>Solanum nigrum</i>), Madeira Winter-cherry (<i>Solanum pseudocapsicum</i>), Vetch (<i>Vicia ?hirsuta</i>); 	All	High	Current
Borer attack of wattles.	Wattles	Moderate	Current
Eucalypt dieback disease due to psyllids and/or leaf skeletonisers.	Eucalypts	Low	Potential

Priority actions

1. Remove Box Elders and willows from the low-level terrace beside the river, just south of the label, 'Floodplain Wetland Complex', on the aerial photograph. Work from west to east. The importance of this task is high.
2. Control the infestation of the declared noxious weeds, Blackberry and Gorse, in the area with the dashed white outline toward the northwest of the aerial photograph. The importance of this task is high.
3. Monitor the development of the wetland beneath the electricity transmission lines, checking for weed invasion or other damage. Take preventative or corrective action as appropriate. This task should be done annually, and the importance is high.
4. Notify whoever is responsible for maintaining vegetation clearance beneath the electricity transmission lines that the wetland is significant and should be protected from damage during clearance work.
5. To augment action 1 above, control vine weeds and woody weeds other than Box Elders and willows on the low-level terrace beside the river. This task has moderate importance. Prior to removing any bindweeds (*Calystegia* species),

check with the National Herbarium of Victoria how to distinguish the various hybrids between indigenous and introduced species. The author has already lodged specimens with the herbarium in the hope that clarification will be forthcoming.

Future revegetation

After Blackberry and Gorse have been controlled in the area with the dashed white outline toward the northwest of the aerial photograph, revegetation should be undertaken where there is presently a gap in the canopy.

The site is not a particularly important resource for collection of seed or propagating material, but small quantities could be collected from the locally rare species that are present.

Records should be kept of any planting done in this (or any other) site, including species, numbers and locations.

Monitoring

This study found no pre-existing data suitable for ecological monitoring.

The following items have been gathered to provide a baseline for future monitoring:

- The aerial photograph on p. 88, to show the amount of vegetation cover in the wetland and the patch of Blackberry and Gorse, and the density of exotic trees in the southeast (recognisable by their distinctive crown colour).
- The photographs below and on p. 89, with locations and orientations marked on the aerial photograph. Repeat about every two years.
- The separate flora species lists for the two vegetation types on the site, presented above. Repeat every few years.

Information sources used in this assessment

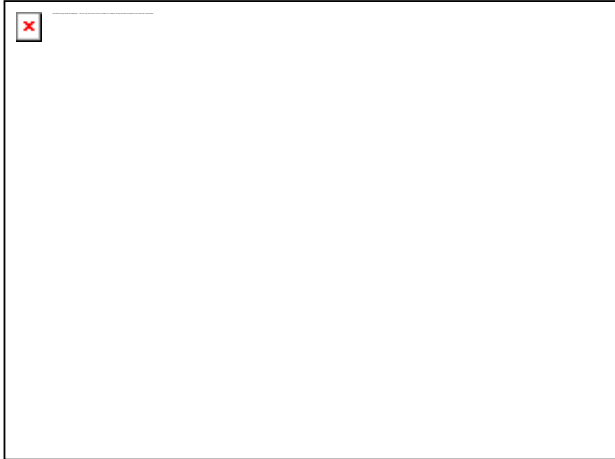
- A vegetation and habitat survey by Dr Lorimer for three hours and forty minutes on 8th March 2005 using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species in each of the two vegetation types in the site, including the species' abundances and the threat level of all weed species in each vegetation type;
 - Mapping, assessment and documentation of populations of plant species that are rare or threatened in the site or more generally;
 - Weed mapping;
 - Assessment and measuring of the larger remnant eucalypts;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for, and notes about, fauna habitat, ecological threats and management issues;
- One spotlighting session on 25/11/04, including the playing of taped owl calls to attract other owls;
- Data from the Department of Sustainability & Environment's flora and fauna databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

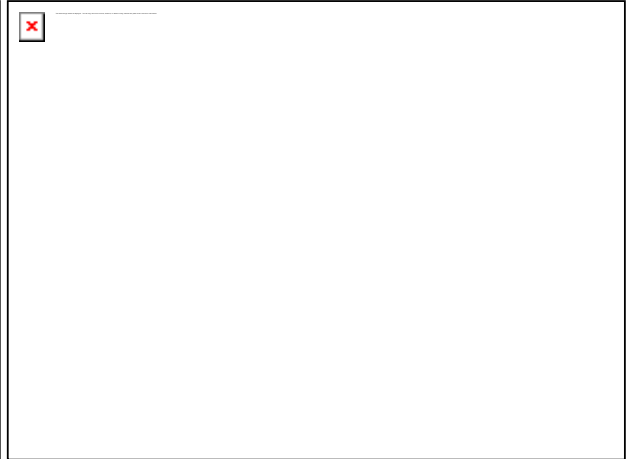
The abundant bindweeds in this site appear to represent a spectrum of hybrids between an indigenous species (*Calystegia sepium*) and a weed species (*Calystegia silvatica*). They are having a major influence on the vegetation by smothering other plants. The author has lodged specimens with the National Herbarium of Victoria to seek clarification regarding how to distinguish the ecologically harmful elements of this spectrum. Herbarium staff are likely to investigate these specimens in spring, 2005.

Monitoring photographs for the Yarra Flats site, taken on 8th March 2005

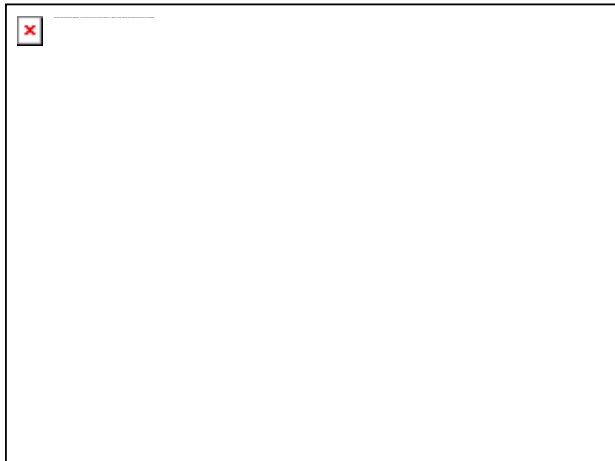
The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 88.



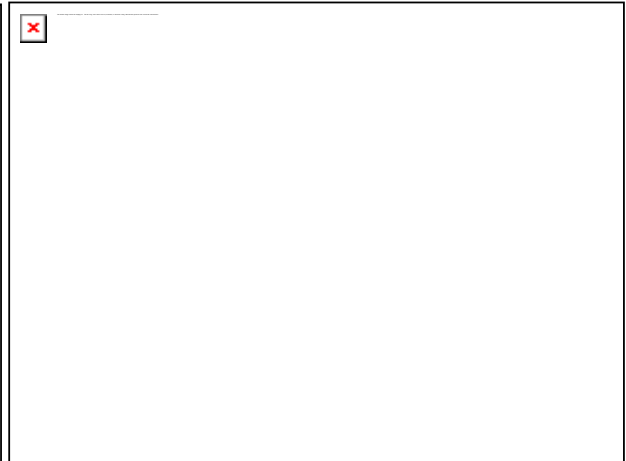
Site 5, Photo 2. Bindweeds just east of the wetland, showing their smothering habit. Clarification has been sought from the National Herbarium of Victoria about indigenous species, *Calystegia sepium*, and the weed, *Calystegia silvatica*.



Site 5, Photo 3. Looking northward over the low-level river terrace from the top of the embankment at its southern edge. This area appears to be in an ecologically unstable state and has the potential to become more or less weedy than shown in this photograph.



Site 5, Photo 4. As for photograph 3, but looking eastward.



Site 5, Photo 5. Looking westward from the fence at the site's eastern extremity, to show the coverage of grass weeds.

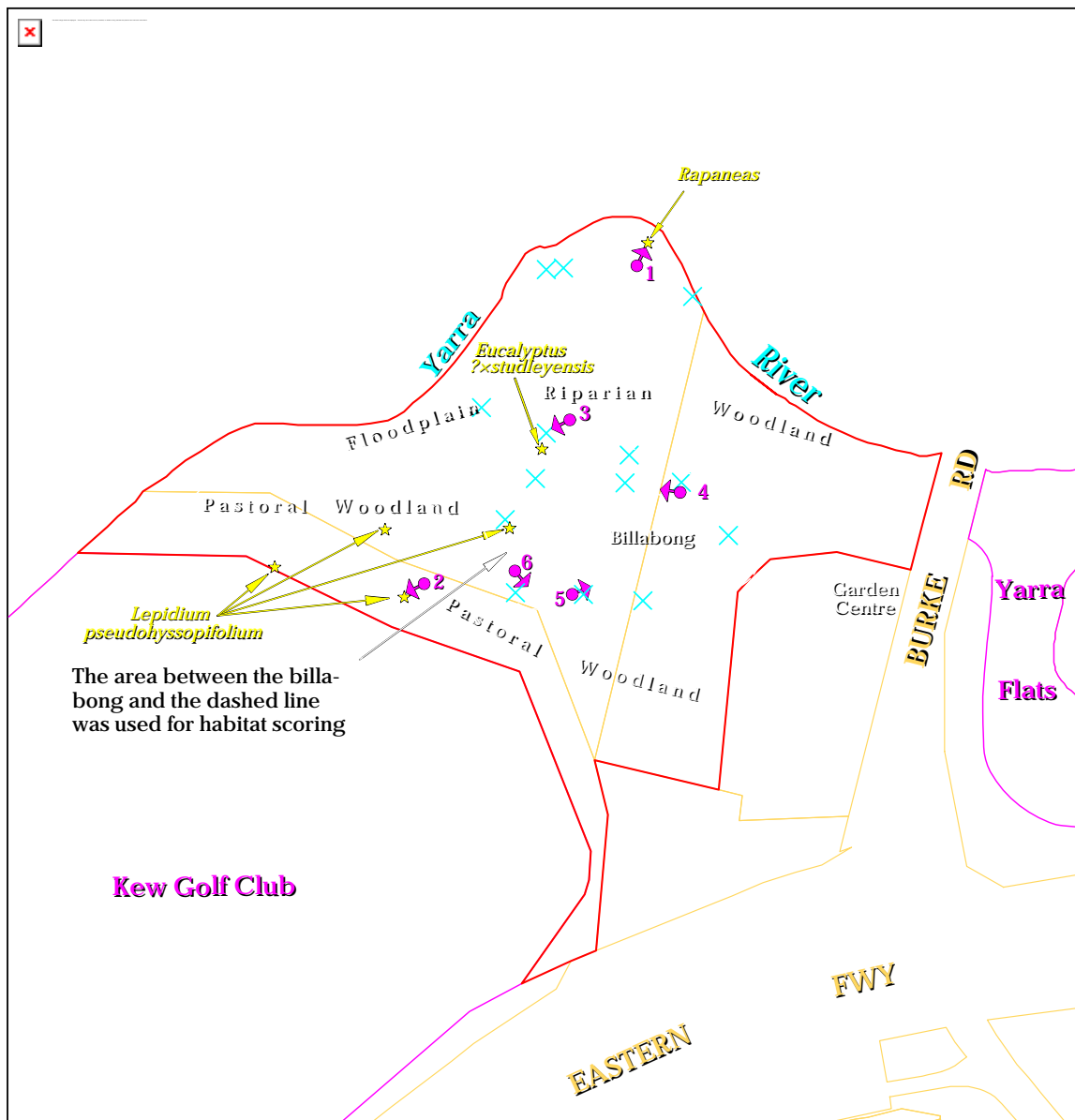
Site 6. Burke Road Billabong, Kew East

Floodplain parkland with a billabong, previously a grazing property. Melway ref. 31 K11.

Site Biological Significance Level: *State*

Summary of significant natural assets

- Both of the Ecological Vegetation Classes (EVCs) present are listed as endangered in the bioregion. They are Floodplain Riparian Woodland and Floodplain Wetland Complex;
- There are viable populations of numerous species of flora and fauna that are threatened in Boroondara or state-wide;
- The site is part of a major ecological corridor along the Yarra River;
- There are fourteen large old River Red Gums, in good health on average.



✕ Large old trees

📍_n Numbered Photo Point



Scale 1:4,500
25 0 50 100 150 200 m

Boundaries

This site's boundary is shown in red on the aerial photograph and follows property boundaries, except that the boundary with Kew Golf Club (to the southeast) follows the golf course fence (which apparently does not coincide with a cadastral boundary). Amber lines represent other property boundaries.

Land use & tenure

The site comprises all of two properties and part of a third. The most easterly property (1585 Burke Rd) is unreserved Crown land. The next property to the west, with most of the site's river frontage, is owned by VicRoads. The land between there and the fence of Kew Golf Club is part of 120B Belford Rd (the golf course property). Despite the various ownerships, the land all functions as parkland. It includes the Main Yarra Trail bike path. Land use changes are strongly limited by land zoning and planning overlays.

Physical features

Site area: 9.9 hectares

Elevation: The normal water level of the Yarra River is at an elevation of 6 m. The floodplain that comprises the rest of the site has an elevation of 10-11 m, except for an artificial embankment beside the garden centre marked on the aerial photograph, which reaches 18 m.

Land form: Floodplain, river and billabong.

Slope: The floodplain slopes very steeply to the waters of the Yarra River, and the embankment beside the garden centre has a gradient of 1:6. Elsewhere, the site is generally flat.

Soil type: Alluvial deposits washed down by the river, and possibly some older deposits from the ancient lake that once covered the area from Chandler Highway to Templestowe.

Underlying geology: Far below the surface, there is Silurian sedimentary rock of the Andersons Creek formation, but this does not influence the natural features of the site.

Site description

This site is clearly one of the most biologically significant sites in Boroondara, and there are likely to be significant features yet to be discovered.

The billabong may well be the most significant part of the site, but it could not be properly investigated for this report because it remained full of water for the whole period during which an inspection was possible (February to April 2005). The aerial photograph shows that the billabong floor was fully vegetated in the previous August, but the only evidence of this when the author visited was an abundance of Water-ribbons (*Triglochin procera*). It would be highly desirable to survey the billabong's vegetation once the billabong dries out, because all other billabongs on the Yarra floodplain in Boroondara support rare plants.

The prolonged inundation around the billabong killed most of the indigenous Prickly Currant-bush (*Coprosma quadrifida*) on the northwestern bank of the billabong, as well as large expanses of the serious weed, Wandering Jew (*Tradescantia fluminensis*). River Red Gums (*Eucalyptus camaldulensis*) and Silver Wattles (*Acacia dealbata*) appeared unaffected, as were the weeds, Hawthorn (*Crataegus monogyna*) and Willow (*Salix* species).

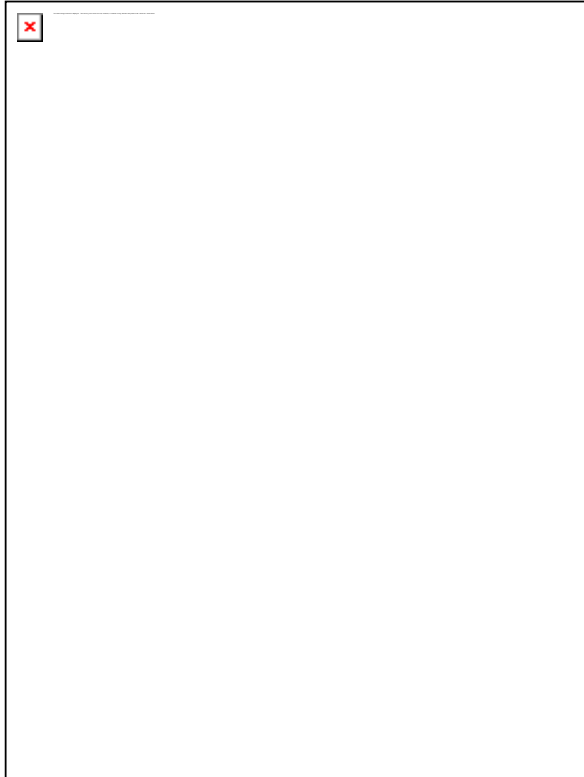
On the two days when the author inspected the site, there was little wildlife on the billabong. However, it was the only site where the Victorian Smooth Froglet (*Geocrinia victoriana*) was found during this study. (The Victorian Smooth Froglet has been recorded previously at this site and several other billabongs downstream.)

The remains of a stock enclosure and the pattern of past clearing and regrowth indicate that this site was once a grazing property, possibly with a building near the northwestern end of the billabong. Not all the native vegetation was cleared for grazing, and at least fourteen centuries-old River Red Gums (*Eucalyptus camaldulensis*) remain. These are marked on the aerial photograph with crosses, scattered around most of the banks of the billabong and some of the riverbank. They are part of the endangered Ecological Vegetation Class called Floodplain Riparian Woodland, and the most ecologically intact representation is between the billabong and the surrounding dashed outline on the aerial photograph.

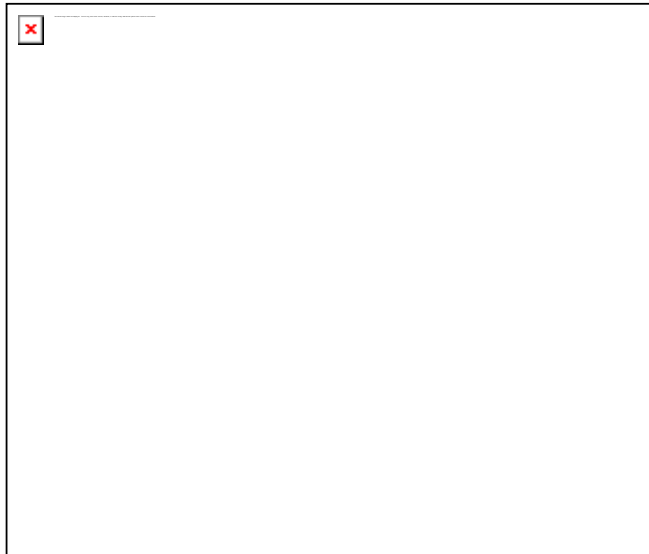
Northward from the billabong to the Yarra River bank, the original forest was once cleared but now has a dense covering of tall regrowth of Silver Wattles (*Acacia dealbata*). The understorey beneath the wattles is almost entirely composed of serious weeds, dominated by a dense carpet of Wandering Jew (*Tradescantia fluminensis*). Although this vegetation is greatly simplified compared with the original Floodplain Riparian Woodland, small insect-eating birds heavily populated the treetops during the fieldwork for this project. At the northern tip of this area of wattle regrowth, there is also a highlight of the site: a copse of approximately eleven Muttonwood trees (*Rapanea howittiana*) with trunk diameters to 25 cm (Photo 1, page 98). There are also other Muttonwoods directly over the opposite side of the river, but no other mature Muttonwoods were found during this study.

Apart from the wattle regrowth north of the billabong, the banks of the Yarra River within the site support a gallery of Floodplain Riparian Woodland, including the characteristic shrubby understorey of Tree Violet (*Melicytus dentatus*), Prickly Currant-bush (*Coprosma quadrifida*) and Hemp Bush (*Gynatrix pulchella*). There are approximately one hundred Hemp Bushes in the site, and the only other site in Boroondara with a substantial number of this locally endangered species is the Freeway Golf Course (Site 4).

The native ground flora of the Floodplain Riparian Woodland in this site has been mostly replaced by weeds, as in all other occurrences in Boroondara.



Site 6, Photo 1. The copse of Muttonwoods (*Rapanea howittiana*), with the Yarra River immediately behind. This photograph is to illustrate the condition of the trees, including the luxuriance of their crowns. The foreground trunks on each side are Silver Wattles (*Acacia dealbata*).



Site 6, Photo 2. Close-up of a typical patch of *Lepidium pseudohyssopifolium* (the upright, leafy stems) amid Blackberry, with the weeds White Clover (*Trifolium repens*) and Cleavers (*Galium aparine*) also visible. The indigenous species, *Geranium* sp. 5, was growing in similar conditions very close by.

To the south and west of the billabong, in the area marked 'Pastoral Woodland' on the aerial photograph, there has been only patchy regrowth of native trees (again, principally wattles), augmented by some planted eucalypts in the southeast. The wattles carry large numbers of the locally vulnerable Grey Mistletoe (*Amyema quandang*), representing most of the total population of that species in Boroondara. There are very few indigenous shrubs, well outnumbered by Blackberry. The ground flora is also very weedy, but it nevertheless contains at least one dozen of *Lepidium pseudohyssopifolium*, which is listed by the Department of Sustainability & Environment as 'poorly known and suspected, but not definitely known, to be [rare or threatened]'. In addition, there are several specimens of this species on the western bank of the billabong, collectively giving the site the largest population of *Lepidium pseudohyssopifolium* in any site in Boroondara. Most of the *Lepidium pseudohyssopifolium* plants grow among Blackberry, as illustrated by Photo 2.

The 'pastoral woodland' area was also observed to house Tiger Snakes and Common Blue-tongued Lizards. There are likely to be other reptiles.

Ecological links with other land

This site includes part of the almost unbroken corridor of vegetation that extends along the Yarra River upstream from Yarra Bend Park. The river and its vegetated fringe are arguably Melbourne's foremost ecological corridor.

The treed area in this site extends further from the Yarra River than any other section of riparian vegetation in Boroondara other than Yarra Bend Park. The site can therefore be viewed as an ecological node on the Yarra River corridor.

Habitat types

Water Body (No EVC number). When it holds water, the billabong provides open water habitat for fish, ducks and other aquatic life, although little wildlife was evident during the author's visits in March 2005.

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion)

Found mainly beside the Yarra River and around the billabong. 25 indigenous plant species and 58 introduced plant species were found.

Canopy trees: *Eucalyptus camaldulensis*, to 1.45 metres trunk diameter, with crowns overlapping.

Lower trees: *Acacia dealbata* is fairly dense, and *Acacia melanoxylon* is fairly abundant in the 'pastoral woodland' area. There is a colony of *Rapanea howittiana* at the northern tip, an outpost of a population on the other side of the Yarra River

Shrubs: *Meliccytus dentatus* (= *Hymenanthera dentata*) is rather dense and typically 2-3 m tall. The population of approximately 100 *Gynatrix pulchella* beside the Yarra River is the largest known in Boroondara. *Coprosma quadrifida* is moderately common. Eight *Goodenia ovata* plants and one *Bursaria spinosa* were seen. *Ozothamnus ferrugineus* is absent, presumably as a result of past clearing. The shrub weed, *Crataegus monogyna*, is abundant.

Vines: No indigenous vines were found. The weed, *Calystegia silvatica*, is scattered.

Ferns: None.

Ground flora: Mature plants of *Microlaena stipoides*, *Juncus amabilis* and *Lepidium pseudohyssopifolium* are fairly common. In addition, at the time of the fieldwork, *Persicaria lapathifolia*, *Persicaria subsessilis*, *Alternanthera denticulata* and *Urtica incisa* had regenerated profusely since the flood eight weeks earlier. The young plants were growing through a layer of silt and flattened, dead weeds, particularly *Tradescantia fluminensis*. Otherwise, the ground flora comprised predominantly introduced species.

Floodplain Wetland Complex (EVC 172, **regionally Endangered**)

Occurring in the billabong, as outlined on the aerial photograph. 4 plant species were found, all of them indigenous.

The vegetation within the billabong cannot be adequately described here because the billabong remained full of water for the whole period during which an inspection for this study was possible (February to April 2005).

Canopy trees: *Eucalyptus camaldulensis* of various ages are fairly dense in the shallow, eastern end of the billabong, with crowns touching each other.

Other woody plants; Vines; Ferns: None.

Ground flora: At the time of the fieldwork, there were many *Triglochin procera* emerging from the water. The only other plant species visible were *Carex appressa* and *Juncus amabilis* at the water's edge.

Habitat Score

Habitat scoring (see p. 13) was conducted within the area of Floodplain Riparian Woodland that surrounds the billabong and lies within the dashed outline on the aerial photograph on page 96. The ecological condition within this area is fairly uniform except for weed cover, which varies from more than 50% in the west to less than 5% in the northeast.

The calculated habitat score varied between 40% for the weediest section to 51% for the least weedy section. As a quirk of the habitat scoring method, the scores would have risen by ten percentage points if a single scrambler or climber were found. This is quite likely to happen once the vegetation regenerates following the flood of February 2005.

Flora of special significance

The species listed in the table below were all observed in March 2005. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status			Species Name	Notes
Victoria	Melbourne	Boroondara		
Data deficient	Rare or threatened	Endangered	<i>Lepidium pseudohyssopifolium</i>	Approximately one dozen, often among Blackberries
	Rare or threatened	Extinct	<i>Ottelia ovalifolia</i>	Abundant in 1964 (H.I. Aston)
	Rare or threatened	Critically Endangered	<i>Rapanea howittiana</i>	One copse of c. 11 stems
	Rare or threatened	Vulnerable	<i>Elatine gratioloides</i>	Abundant in 1964 (H.I. Aston)
	Rare or threatened	Vulnerable	<i>Persicaria prostrata</i>	Very scarce
	Rare or threatened	Vulnerable	<i>Urtica incisa</i>	Locally abundant seedlings
	Rare or threatened	Secure	<i>Persicaria subsessilis</i>	Abundant
		Endangered	<i>Carex appressa</i>	

Conservation Status			Species Name	Notes
Victoria	Melbourne	Boroondara		
		Endangered	<i>Eleocharis acuta</i>	Only 1 m ² found
		Endangered	<i>Geranium</i> ?sp. 5	Numerous
		Endangered	<i>Gynatrix pulchella</i>	Approximately 100 plants
		Vulnerable	<i>Juncus subsecundus</i>	Scarce
		Vulnerable	<i>Amyema quandang</i>	Numerous
		Vulnerable	<i>Goodenia ovata</i>	Eight plants found

Full flora list

The following table includes all twenty-eight indigenous plant species and fifty-eight introduced plant species found at the site during this study, plus two species collected by Helen I. Aston in 1964, categorised according to the species' presence in four areas of the site. The column labelled 'Area A' is for the Floodplain Riparian Woodland around the billabong and beside the Yarra River. 'Area B' is the wattle regrowth north of the billabong. 'Area C' is the 'Pastoral Woodland' area marked on the aerial photograph (page 96). In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Species with underlined names would be suitable for collection of seed or cuttings.

Species Name	Area A	Area B	Area C	Billabong	Species Name	Area A	Area B	Area C	Billabong				
Indigenous species					Possibly planted					<i>Lonicera japonica</i>	-		
<u><i>Acacia dealbata</i></u>	D	D	M		<i>Acacia mearnsii</i>	-				<i>Lycium ferocissimum</i>	-		
<i>Alternanthera denticulata</i>	✓				<i>Acacia melanoxylon</i>	-				<i>Modiola caroliniana</i>	✓		
<i>Amyema quandang</i>	M				Introduced species					<i>Nassella ?neesiana</i>		M	
<i>Bursaria spinosa</i>	-				<i>Acer negundo</i>	✓				<i>Oxalis ?incarnata</i>	-		
<u><i>Carex appressa</i></u>	-			✓	<i>Anthoxanthum odoratum</i>			-		<i>Paspalum dilatatum</i>			M
<u><i>Coprosma quadrifida</i></u>	✓				<i>Araujia sericifera</i>	✓	M			<i>Pennisetum clandestinum</i>		✓	
<i>Elatine gratioloides</i> *	-			✓	<i>Artemisia verlotiorum</i>	✓				<i>Phalaris aquatica</i>	-		
<u><i>Eleocharis acuta</i></u>	-				<i>Aster subulatus</i>	-				<i>Pinus radiata</i>			-
<u><i>Eucalyptus camaldulensis</i></u>	D	-	✓	✓	<i>Atriplex prostrata</i>					<i>Pittosporum undulatum</i>	✓	✓	
<u><i>Geranium</i> sp. 5</u>			M		<i>Bromus catharticus</i>	✓	✓			<i>Plantago lanceolata</i>	✓	M	
<u><i>Goodenia ovata</i></u>	✓				<i>Calystegia silvatica</i>	-		-		<i>Plantago major</i>	-		
<u><i>Gynatrix pulchella</i></u>	M				<i>Chrysanthemoides monilifera monilifera</i>			✓		<i>Polygonum aviculare</i>	-		
<u><i>Juncus amabilis</i></u>	✓	✓	✓		<i>Cirsium vulgare</i>	✓				<i>Prunus cerasifera</i>	✓		
<u><i>Juncus subsecundus</i></u>	-				<i>Conium maculatum</i>	-				<i>Quercus robur</i>			-
<u><i>Lepidium pseudohyssopifolium</i></u>	✓	✓			<i>Coprosma repens</i>			-		<i>Ranunculus repens</i>	-		-
<u><i>Melaleuca ericifolia</i></u>	-				<i>Crataegus monogyna</i>	M	✓			<i>Rorippa palustris</i>	-		-
<u><i>Meliclytus dentatus</i></u>	D	✓	✓		<i>Cynodon dactylon</i>	M	D			<i>Rosa rubiginosa</i>			✓
<i>Microlaena stipoides</i>	✓				<i>Cyperus eragrostis</i>	-		-		<i>Rubus ?anglocandicans</i>	✓	D	
<i>Muellerina eucalyptoides</i>	✓	✓			<i>Dactylis glomerata</i>	✓	✓			<i>Rumex crispus</i>	✓	M	
<i>Ottelia ovalifolia</i> *				✓	<i>Ehrharta erecta</i>	✓	✓			<i>Rumex ?obtusifolius</i>	✓	✓	
<i>Oxalis exilis/perennans</i>			✓		<i>Fallopia convolvulus</i>	✓	M			<i>Salix ?fragilis</i>	M		
<u><i>Persicaria hydropiper</i></u>	-				<i>Foeniculum vulgare</i>	✓	✓			<i>Salpichroa organifolia</i>	M	✓	
<u><i>Persicaria lapathifolia</i></u>	M				<i>Fumaria</i> sp.	✓				<i>Solanum americanum</i>	✓		
<u><i>Persicaria prostrata</i></u>	-				<i>Galium aparine</i>	M	M			<i>Solanum nigrum</i>	✓		
<u><i>Persicaria subsessilis</i></u>	M				<i>Genista monspessulana</i>			-		<i>Solanum pseudocapsicum</i>	✓		
<u><i>Rapanea howittiana</i></u>	-				<i>Helminthotheca echioides</i>	-		-		<i>Sonchus oleraceus</i>	-		
<u><i>Triglochin procera</i></u>				M	<i>Hypochoeris radicata</i>			✓		<i>Taraxacum</i> sp.			✓
<i>Urtica incisa</i>	✓				<i>Ligustrum lucidum</i>	-				<i>Tradescantia fluminensis</i>	D	D	-
					<i>Lolium perenne</i>			-		<i>Ulex europaeus</i>	-		
										<i>Verbena bonariensis</i>	✓	✓	
										<i>Zantedeschia aethiopica</i>	-		

* Collected by H.I. Aston, 10/12/63

Large old trees

The site is notable for the presence of fourteen identified River Red Gums (*Eucalyptus camaldulensis*) that qualify as large old trees according to the Department of Sustainability & Environment's criterion for Floodplain Riparian Woodland (i.e. trunk diameters of at least 0.8 m). These are marked with cyan crosses on the aerial photograph on page 96. The maximum diameter was 1.45 metres, which makes it one of the largest indigenous trees in Boroondara, hundreds of years old.

The health of all but two of the trees was rated by the author as good. The exceptions were one in very good health and one in fair to good health.

Fauna of special significance

The significant fauna species in the list below have been observed in the Burke Road Billabong site. The conservation status ratings (e.g. endangered or vulnerable) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Last Record
Melbourne	Boroondara		
Near Threatened	Endangered	Platypus	2005
Near Threatened	Occasional Visitor	Bassian Thrush	1997
	Endangered	Victorian Smooth Froglet	2005
	Endangered	Southern Bullfrog	1994
	Endangered	Striped Marsh Frog	1990
	Endangered	Spotted Marsh Frog	1994
	Endangered	Southern Brown Tree Frog	2005
	Endangered	Common Blue-tongued Lizard	2005
	Endangered	Spotted Pardalote	2005
	Vulnerable	Little Black Cormorant	2005
	Vulnerable	White-faced Heron	2005
	Vulnerable	Eastern Rosella	2005
	Vulnerable	Superb Fairy-wren	2005
	Vulnerable	White-browed Scrubwren	2005
	Vulnerable	Eastern Spinebill	2005
	Vulnerable	Eastern Yellow Robin	2005
	Vulnerable	Grey Shrike-thrush	2005
	Vulnerable	Grey Fantail	2005
	Occasional Visitor	Common Bronzewing	2005
	Occasional Visitor	Grey Currawong	2005

Full fauna list

The following list includes all fauna species recorded at the site. The names of species not detected in the present study are accompanied by the date of the most recent record. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies	Frogs	Birds	Birds (continued)
*Cabbage White	Common Froglet (1994)	Pacific Black Duck	Bell Miner
Common Brown	†Victorian Smooth Froglet	Little Black Cormorant	Noisy Miner
Common Grass-blue	†Southern Bullfrog (1994)	White-faced Heron	White-plumed Honeyeater
	Striped Marsh Frog (1990)	Eurasian Coot (1990)	Eastern Spinebill
	†Spotted Marsh Frog (1994)	*Spotted Turtle-Dove	Eastern Yellow Robin
Fish	Southern Brown Tree Frog	Common Bronzewing	Grey Shrike-thrush
*Carp (1979)		Rainbow Lorikeet	Magpie-lark
*Redfin (1979)	Mammals	Eastern Rosella	Grey Fantail
	Common Brushtail Possum	Superb Fairy-wren	Grey Butcherbird
	Common Ringtail Possum	Spotted Pardalote	Grey Currawong
Reptiles	(2002)	White-browed Scrubwren	Silvereye
Common Blue-tongued	*Black Rat	Brown Thornbill	Bassian Thrush (1997)
Lizard	*Red Fox	Red Wattlebird	*Common Blackbird
Tiger Snake			

Site significance rating

This site is part of the Department of Sustainability & Environment's BioSite number 5063, which extends along the Yarra River from Burke Rd to Chandler Hwy, on both sides of the river. The significance level given in the BioSites database is 'Regional', but this was based on information and criteria from the 1990s that are now obsolete. The following is an assessment against the current BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to this site.

BioSites criterion 1.1.2 attributes **Local** significance to 'Areas of 100 ha or more of contiguous native vegetation in a heavily fragmented landscape', which applies to the corridor of vegetation along the banks of the Yarra River (extending upstream and downstream of this site).

BioSites criterion 1.2.6 attributes **Regional** significance to links of regional-scale ecological corridors, which applies to this site because its vegetation represents a component of the Yarra River corridor.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), even quite degraded native vegetation belonging to an endangered EVC (including both EVCs on this site) has a conservation significance rating of High. The conservation significance rises to Very High where the habitat score is at least 40% within an area of an endangered EVC, and the habitat score for part of the Burke Road Billabong site was found to be 51%.

According to BioSites criterion 3.2.3, **State** significance applies to any site with a 'remnant patch' whose conservation significance is High or Very High due to the presence of a threatened EVC. This applies to the present site, noting that the area and native understorey cover of the native vegetation easily meets any reasonable definition of a remnant patch.

Rare or threatened plants

The site has a modest population (approximately one dozen plants) of *Lepidium pseudohyssopifolium*, which is listed by DSE (2005a) as suspected (but not confirmed) to be rare or threatened. BioSites criterion 3.1.2 attributes **Regional** significance to such a site, taking into account that the species is not endemic to Victoria.

The site also supports ten other species of plants that are threatened in Boroondara, some of them in abundance. Each one of the species with viable populations gives the site **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

It is not clear how many of the significant fauna species recorded in this site have viable populations that rely to a substantial degree on the site's habitat, other than the Victorian Smooth Froglet (which has been recorded repeatedly from the billabong). However, it only takes one such species for the site to qualify for **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds, particularly low ones smothering the ground flora and woody weeds out-competing indigenous shrubs and small trees. The species of concern are: <ul style="list-style-type: none"> • Very serious: Blackberry (<i>Rubus ?anglocandicans</i>); • Serious: Box Elder (<i>Acer negundo</i>), White Bladder-flower (<i>Araujia sericifera</i>), Hawthorn (<i>Crataegus monogyna</i>), Couch (<i>Cynodon dactylon</i>), Black Bindweed (<i>Fallopia convolvulus</i>), Cleavers (<i>Galium aparine</i>), Crack Willow (<i>Salix ?fragilis</i>), Pampas Lily-of-the-Valley (<i>Salpichroa organifolia</i>), Wandering Jew (<i>Tradescantia fluminensis</i>). 	All	High	Current

Threat	Natural assets affected	Severity	When?
Soil erosion of the banks of the Yarra River during flood.	Floodplain Riparian Woodland; large old trees	Moderate	Any major flood
Eucalypt dieback disease due to psyllids and/or leaf skeletonisers. This threat appears to have been a problem previously and is likely to recur from time to time.	Floodplain Riparian Woodland; Hollow-bearing trees; Wildlife corridor	Low	Potential
The population of the aggressive Bell Miner is out of ecological balance and is evicting birds such as small insectivores. This, in turn, represents a threat to the health of the River Red Gums.	Floodplain Riparian Woodland; birdlife	Low	Current
Predation by foxes.	Fauna	Low	Current
Pollution of water or sediment in the billabong (suggested by the presence of an algal bloom and the apparent paucity of normal aquatic life).	Floodplain Wetland Complex; flora and fauna	Unknown	Unknown
Carp or other native fish, causing turbidity, eating native fauna (e.g. tadpoles) and competing for resources with native fauna.	Native fish; Frogs; Other native aquatic life	Unknown	Unknown

Past management and revegetation

The site appears to have been historically managed as a grazing property. Old drums and other metal waste have been dumped by the billabong. The drums may have had farm chemicals in them, and leakage into the billabong may explain the apparent paucity of aquatic life.

In recent years, there has been a small amount of revegetation in the southeast of the site, comprising only tree species. Expanses of pasture grass and weeds in the 'pastoral woodland' area had grown rank at the time of the inspection for this study (March 2005). Other serious but tractable weeds, such as Blackberry and Hawthorn (*Crataegus monogyna*), were also rampant. The exception was Gorse (*Ulex europaeus*), which had been sprayed recently with a reasonable degree of success.

Overall, the site is not receiving the level of management effort required.

Priority actions

- Very important and urgent:** Devise and implement a staged program to control blackberry and Hawthorn, and follow up the recent control of Gorse. (These species are all declared noxious weeds.) Use chemical(s) that do not pose a serious threat to the herbaceous rare plant, *Lepidium pseudohyssopifolium*, which grows among some of the blackberries. Near the billabong, use a chemical or method that presents low risk to the aquatic environment. Aim to remove these weeds over several years, synchronised with a program to plant indigenous shrubs (particularly *Coprosma quadrifida*, *Melicytus dentatus*, *Melaleuca ericifolia* and *Callistemon sieberi*) to provide substitute habitat for small birds such as wrens. These actions probably require cooperation between the organisations responsible for the Crown land and VicRoads property.
- Destruction of the weeds, Sweet Pittosporum (*Pittosporum undulatum*) and Box Elder (*Acer negundo*), is not quite as urgent as the noxious weeds just discussed. However, depending on the method employed for removing the Hawthorn, it may be economical to do so in conjunction with the Sweet Pittosporums and Box Elders. The importance and urgency are both moderate.
- Spray the needle-grass (*Nassella/Stipa ?neesiana*) on and beside the slashed vehicle route to the Melbourne Water sewer inspection point in the northwest of the site. This weed species appears to have been spread by the slashing or use of this route. Spraying should be done in November, when it can be readily identified, with follow-up in subsequent Novembers. The importance is moderate and the urgency is high.
- Arrange testing for chemical contamination of water and sediment in the billabong. This is because of the unexpectedly low aquatic life (other than algal bloom) that was seen during the inspection of the site for this report. This should be done urgently and is of high importance. Carp should be considered as an alternative explanation.
- Collect a small proportion of the seed of each plant of *Lepidium pseudohyssopifolium* and *Rapanea howittiana*, to allow propagation for planting within the site or in secure locations elsewhere along the Yarra River (e.g. Yarra Bend Park or Freeway Golf Course).

Future revegetation

Development of a program of future revegetation would require knowledge of plans for the future of the Crown land, the VicRoads property and the part of the golf club land that lies within the site. A landscape plan would be highly desirable. Some recommendations for revegetation are expressed in Priority Actions 1 and 5 above. The western bank of the billabong, where the Main Yarra Trail passes close to the billabong, could be a high priority for bushland rehabilitation and creation of a safe, attractive access to the billabong.

Species of plants that are growing in the site and would be suitable for collection of seed or cuttings are underlined in the full flora list above.

If it becomes possible to obtain plants of *Calystegia sepium* that are known not to be genetically contaminated by the serious weed, *Calystegia silvatica*, they would be ideal for planting by the river and billabong. A single plant of this species (or another indigenous scrambler or climber, such as *Calystegia marginata*) next to the billabong would be enough to raise the habitat score by ten percentage points.

Records should be kept of any planting done in this (or any other) site, including species, numbers and locations.

Monitoring

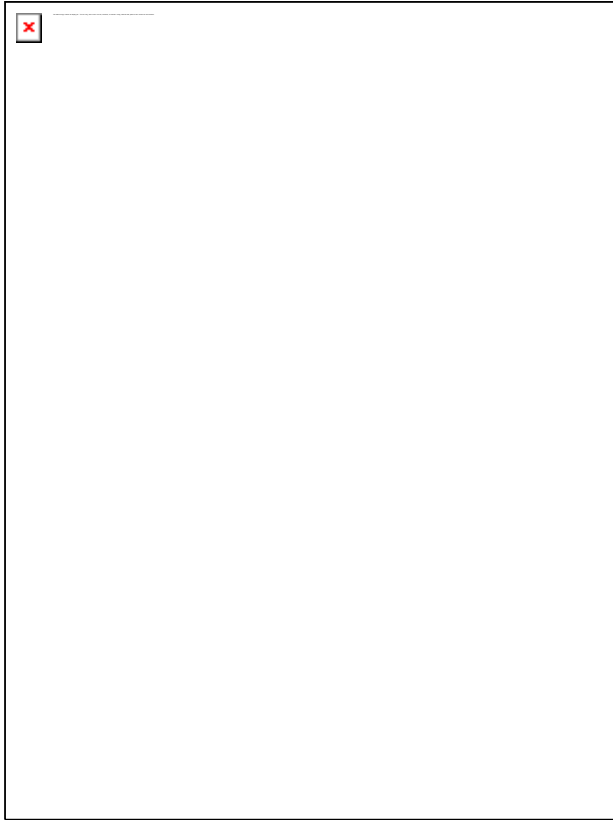
Prior to this study, the only pre-existing data suitable for ecological monitoring were the meticulous records of frogs by Ewen McGilp in 1994. The present study could not inspect the billabong during a suitable season to provide complementary frog data to allow a comparison with McGilp's data, other than to confirm that the Victorian Smooth Froglet remains.

The following items have been gathered to provide a baseline for future monitoring:

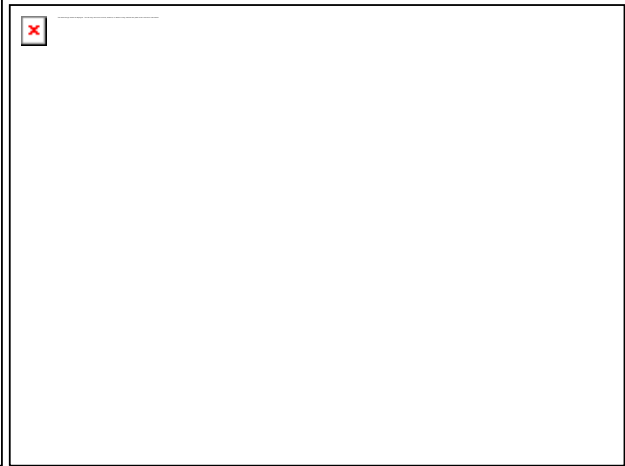
- Photographs 1, 3, 4, 5 and 6 as displayed on pages 98 & 105, with locations and orientations shown on the aerial photograph on page 96. All were taken on 30th March 2005. Original digital images are available separately. Repeat the photographs about every two years. Check tree foliage density, the abundance of weeds and structural changes in the vegetation.
- The flora lists for the various parts of the site, as provided beneath the heading 'Full flora list' above.
- Ratings of weed severity within each part of the site, stored in the database of this study.
- Population sizes of scarce plant species, as indicated beneath the heading 'Flora of special significance' above.
- Tree health ratings, as stored in the geographic information system data from this study and summarised above.
- The habitat score determination for the zone around the billabong, as marked with a dashed line on the aerial photograph. The original field data sheets are available separately. Repeat every two to four years. Check the abundance of weeds, structural changes in vegetation, changes in habitat score and the species present.

Monitoring photographs for the Burke Road Billabong, taken on 30th March 2005

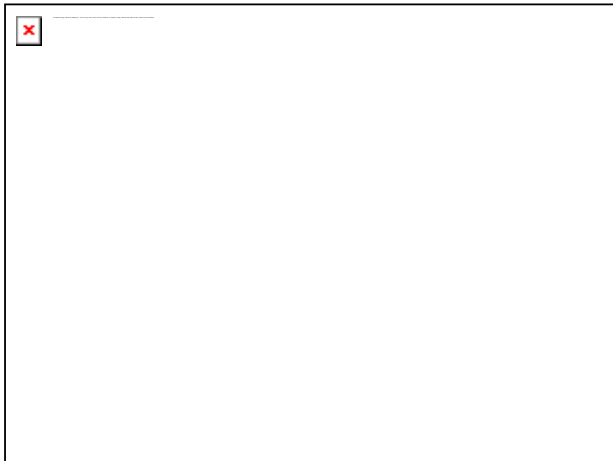
The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 96.



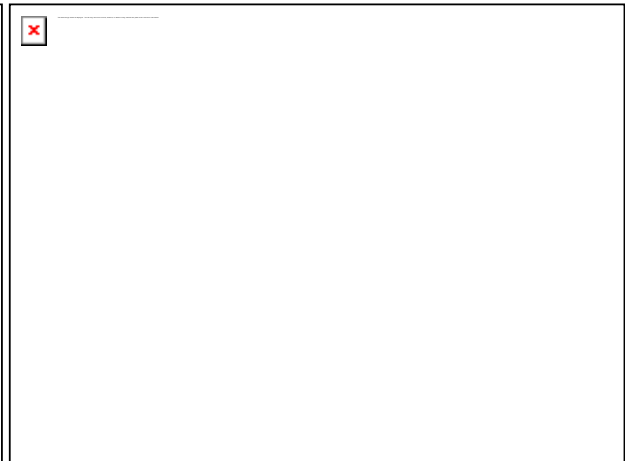
Site 6, Photo 3. A large River Red Gum in good health at the north of the billabong. The purpose of the photograph is to show the tree's overall condition and the luxuriance of its crown. The leaves of Box Elders are turning yellow for autumn.



Site 6, Photo 4. A westward view of the northeastern shore of the billabong, taken from 2 m south of an extremely large River Red Gum. The ground is bare due to a record flood seven weeks prior. *Coprosma quadrifida* plants have died from waterlogging.



Site 6, Photo 5. Looking east over the southern part of the billabong, from a pile of metal rubbish in the billabong's southwestern corner. The large tree on the right-hand edge is marked on the aerial photograph on p. 96. The River Red Gums in the eastern end of the billabong had been flooded for at least seven weeks (and probably rather longer) when this photograph was taken.



Site 6, Photo 6. Looking southeast between the billabong and the Main Yarra Trail, taken at the intersection of two informal, well-worn footpaths. The purpose of the photograph is to show the present weedy state of an area that should be rehabilitated by weed control, revegetation and possibly an improved path to the billabong.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for one hour and forty minutes on 8th March 2005 and eight hours, forty-five minutes on 30th March 2005, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species in each of four parts of the site, including the species' abundances and the threat level of all weed species in each area;
 - Mapping, assessment and documentation of populations of plant species that are rare or threatened in the site or more generally;
 - Weed mapping;
 - Assessment of habitat score;
 - Individual assessment of all large old trees;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases;
- The Department of Sustainability & Environment's BioMaps of the area;
- Aerial photography from August 2004;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

- It would be desirable to investigate the vegetation of the Burke Road Billabong when it dries out. All nearby billabongs were found to support rare flora, and the same is likely in the Burke Road Billabong. Particular attention should be paid to the possibility that *Amphibromus fluitans* occurs in the billabong, which would represent National significance as the type locality for that species.
- A survey of frogs in the billabong would be desirable in spring. It would also be desirable to check for the nationally threatened Warty Bell Frog (or Growling Grass Frog) in hot summer weather.
- As noted above, tests should be conducted for pollution of water or sediment in the billabong, prompted by the unexpected paucity of aquatic life observed in the inspection of the site for this study. Carp should be considered as an alternative explanation.
- This site would be one of the most promising in Boroondara for any survey of reptiles or bats.

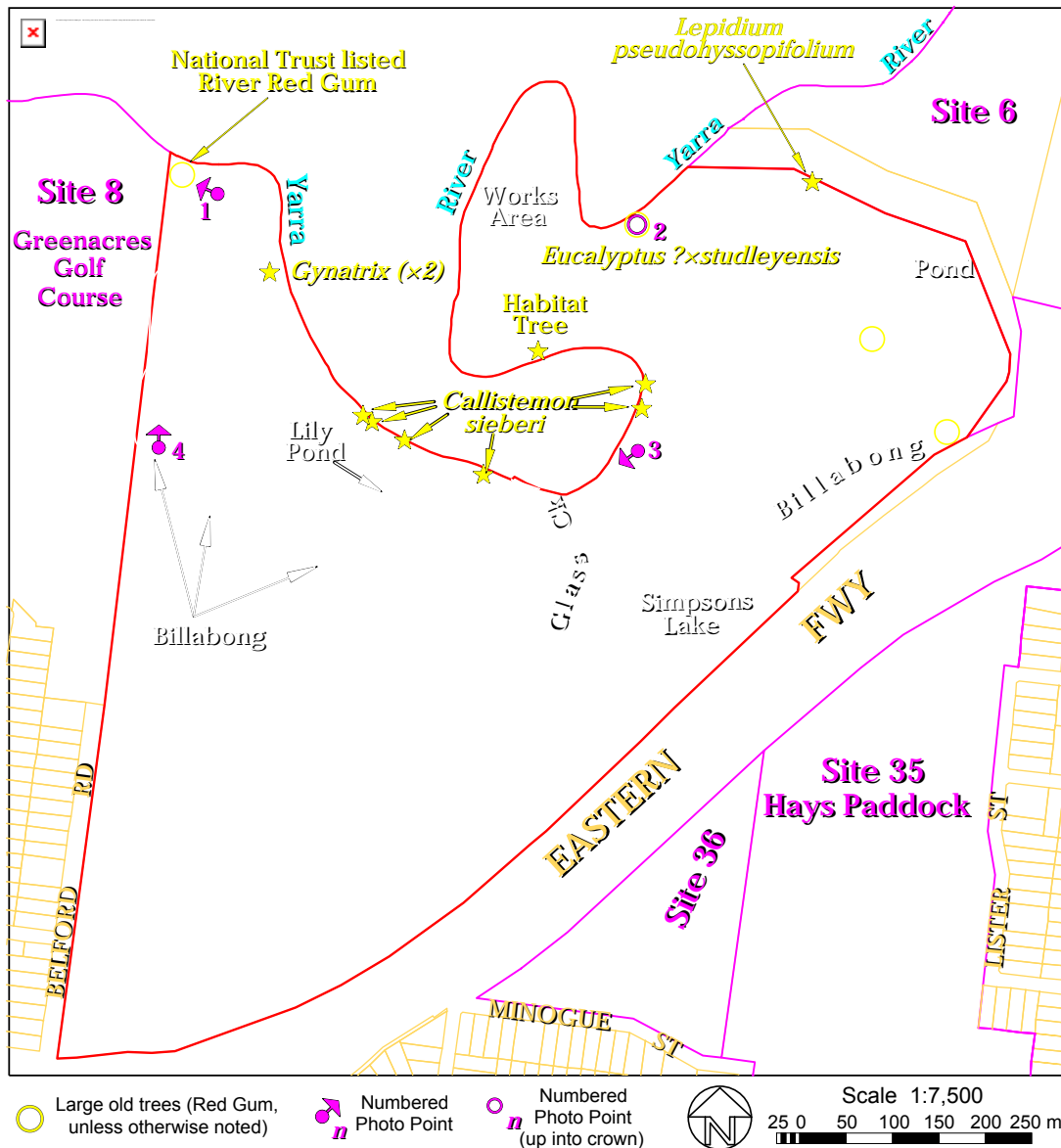
Site 7. Kew Golf Club

Private golf course with native vegetation bordering the Yarra River and billabongs. Melway ref. 31 H12.

Site Significance Level: *State* generally and *National* for a single Studley Park Gum

Summary of significant natural assets:

- The endangered Ecological Vegetation Classes, Floodplain Riparian Woodland and Floodplain Wetland Complex;
- Viable, breeding populations of numerous species of flora and fauna that are threatened in Boroondara or state-wide;
- A single, very rare Studley Park Gum (*Eucalyptus ×studleyensis*);
- Part of a major ecological corridor along the Yarra River;
- At least four large old River Red Gums, in good health on average.



Boundaries

The site of biological significance is taken here to be the whole golf course, as outlined in red above. Most of the boundary follows the Yarra River and wire mesh fences. The boundary abutting Site 8 (Greenacres Golf Course) is a continuation of the alignment of Belford Rd. The fence between Kew Golf Club and Site 6 (the Burke Road Billabong) does not coincide with the golf course's cadastral boundary, which lies well within Site 6 and is drawn in yellow above.

Land use & tenure: Private golf course

Physical features

Site area: 55.7 hectares

Elevation: The normal water level for the river and water bodies is at an elevation of 6 m. The golf course is mostly on the floodplain at an elevation of approximately 11 m, but rises to approximately 32 m in the vicinity of the clubhouse in the southwest corner.

Landform: Floodplain, riverbank and lower valley slope.

Slope: Land surrounding the river is generally flat but slopes down sharply at the river. The area around the clubhouse is on a slope facing northeast, with a gradient of 1:11.

Soil type: The sloping land around the clubhouse originally had thin, light grey duplex soil, which has been modified by excavation. The rest of the site has brown to orange-brown, clayey deposits that have been washed down the Yarra River and Glass Creek (as alluvium), or perhaps partly deposited in the ancient lake that once covered the area from Chandler Highway to Templestowe.

Underlying geology: The bedrock is Silurian sedimentary rock of the Dargile formation. However, apart from the clubhouse area (where there is no native vegetation), the bedrock is deeply buried under alluvium and does not materially influence the natural features of the site.

Site description

This is one of the most zoologically significant sites in Boroondara, principally for the rare fauna of its wetlands (and particularly for breeding colonies of waterbirds). It is also highly significant for the presence of rare plants.

The vegetation beside the Yarra River is part of a much longer corridor of the endangered Floodplain Riparian Woodland. Its native ground flora has been mostly replaced by weeds or (quite recently) revegetation plots. Weed control has led to a lower prevalence of serious woody weeds than in most sites along the river, but willows (*Salix* species) and Desert Ash (*Fraxinus angustifolia*) are still serious.

Although there are not many large old River Red Gums (*Eucalyptus camaldulensis*) left in the site, one is of particular importance: A tree listed by the National Trust because it was used by Robert Hoddle in 1844 to mark a land boundary in the first land sale in Melbourne – see Photo 1 on page 117. It must have stood out as a landmark tree at that time, 161 years ago. Its present trunk diameter is 1.0 metres. There is also a very old specimen of the statewide-endangered Studley Park Gum (*Eucalyptus ×studleyensis*, identification ~90% certain) with a trunk diameter of 1.03 m – see Photo 2 on page 117.

Swamp Paperbark (*Melaleuca ericifolia*) is scattered along the river and around billabongs. This is important because some fauna (notably the rare Glossy Grass Skink and Nankeen Night Heron) rely on the habitat formed by paperbarks, which are now quite scarce elsewhere along the river. Nankeen Night Herons are regularly seen in the site (including during this study), but there has been no reptile search to establish whether the Glossy Grass Skink is present.

The golf course has modified the floodplain's topography and the natural flood regime has been substantially altered. However, the remaining billabongs still represent quite significant habitat for flora and fauna. Each billabong and pond is quite different from the others, due to size, depth, intermittency of flooding, slope of the banks, history of excavation and the mowing regime around the banks. Each one supports at least one locally threatened plant species, mostly around the edges where periodic inundation occurs. It is also quite likely that other significant plants, such as Mud Dock (*Rumex bidens*), occur deeper in the billabongs, but could not be found in the present study due to flooding at the time of the site inspection.

The largest billabong, in the eastern corner, is subject to a Public Acquisition Overlay. It was dammed around the middle of the twentieth century to create Simpsons Lake, part of which was lost to the Eastern Freeway in the mid 1970s. The lake is home to the only breeding colony of Darters in Melbourne, and several other waterbird species breed there annually.

Glass Creek meets the Yarra River within the golf course. The locally threatened fish species, Common Galaxias and Broadfin Galaxias, must migrate through the golf course because they have been recorded just upstream of the course, but there has been no fish study within the golf course. The Nankeen Night Heron hunts fish and frogs along the creek as well as at billabongs.

The property's vegetation is generally well managed except between the Eastern Freeway and the easternmost billabong, where Blackberry and other weeds are running rampant.

The area within 300 m of the clubhouse is not particularly biologically significant, but the planted Australian native plants there and elsewhere around the course still provide habitat for substantial numbers of native birds.

Ecological links with other land

This site includes part of the almost unbroken corridor of vegetation that extends along the Yarra River upstream from Yarra Bend Park. The river and its vegetated fringe are arguably Melbourne's foremost ecological corridor. Native

vegetation on neighbouring sites and on the opposite side of the Yarra River is critical for the ecological functioning of the Kew Golf Club's flora and fauna.

Habitat types

Perennial Stream (No EVC number).

Water Body (No EVC number). Some billabongs provide open water habitat for fish, ducks and other aquatic life.

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion)

A total of approximately 3-4 ha occurs on the banks of the Yarra River and in patches around the billabongs. 28 indigenous plant species and 40 introduced plant species were found.

Canopy trees: Almost solely *Eucalyptus camaldulensis*, to 30 m tall and >1 m trunk diameter, with crowns overlapping.

Lower trees: *Acacia dealbata* is dense. There are also smaller numbers of *Acacia melanoxylon* and *Acacia mearnsii*, the latter augmented by planted specimens. *Melaleuca ericifolia* is scattered around the billabongs. The weeds, *Fraxinus angustifolia* and *Salix* species, are fairly abundant.

Shrubs: *Meliccytus dentatus* (= *Hymenanthera dentata*) is dense and typically 2-3 m tall. There are also substantial numbers of *Coprosma quadrifida*, three *Callistemon sieberi* plants and two *Gynatrix pulchella* (plus planted specimens). The shrub weeds, *Crataegus monogyna* and *Prunus cerasifera* are abundant.

Vines: There were no native vines at the time of the fieldwork (November 2004), but Blackberry was abundant in places. Since floods in early 2005, the *Calystegia sepium/silvatica* complex is likely to have emerged, as elsewhere along the Yarra River.

Ferns: None.

Ground flora: Overrun by weeds, particularly Wandering Jew (*Tradescantia fluminensis*), Carolina Mallow (*Modiola caroliniana*) and Cleavers (*Galium aparine*). Notably, the scattered indigenous species include *Lobelia pedunculata*, species of *Juncus* and *Persicaria*, and the rare *Lepidium pseudohyssopifolium*.

Floodplain Wetland Complex (EVC 172, **regionally Endangered**), incorporating Billabong Wetland

Occurring in the four billabongs, pond and 'lily pond' marked on the aerial photograph on page 107. (Simpsons Lake does not support this EVC, being superficially devoid of vegetation). 28 indigenous plant species (excluding overhanging branches) and 3 introduced plant species were found.

Woody plants: Apart from overhanging branches, the only woody plants are some stems of *Melaleuca ericifolia* encroaching from the banks.

Dominant species: The various billabongs are dominated by different herb species, but *Triglochin procera* and species of *Juncus* and *Persicaria* are the most consistent species. Other characteristic species include *Crassula helmsii*, *Elatine gratioloides*, *Eleocharis sphacelata*, *Isolepis* species and the floating species, *Landoltia punctata*, *Lemna disperma* and *Wolffia australiana*.

Flora of special significance

The single specimen of *Eucalyptus* × *studleyensis* in the list below was identified as such by the author and an identifications officer at the National Herbarium of Victoria, but not with certainty. A specimen and photograph are kept at the herbarium for reference and the photograph is presented as Photo 2 on page 117.

Lepidium pseudohyssopifolium is listed by the Department of Sustainability & Environment's as data deficient, which means that the species is suspected to be rare or threatened but that there is too little information available to be confident. The other conservation status ratings below (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status			Species Name	Last Record	Notes
Victoria	Melbourne	Boroondara			
Endangered	Rare or threatened	Critically Endangered	<i>Eucalyptus</i> × <i>studleyensis</i>	2004	One only
Data Deficient	Rare or threatened	Endangered	<i>Lepidium pseudohyssopifolium</i>	2004	c. 12 found in east
	Rare or threatened	Vulnerable	<i>Landoltia</i> (= <i>Spirodela</i>) <i>punctata</i>	2004	
	Rare or threatened	Vulnerable	<i>Elatine gratioloides</i>	2004	Eastern billabong
	Rare or threatened	Vulnerable	<i>Persicaria praetermissa</i>	2004	Very scarce
	Rare or threatened	Vulnerable	<i>Persicaria prostrata</i>	2004	Very scarce
	Rare or threatened	Secure	<i>Wolffia australiana</i>	2004	
	Rare or threatened	Secure	<i>Persicaria subsessilis</i>	2004	1 beside 3rd green
		Critically Endangered	<i>Euchiton involucreatus</i>	2004	
		Critically Endangered	<i>Kunzea ericoides</i> spp. agg.	2004	Very scarce
		Critically Endangered	<i>Lobelia pedunculata</i>	2004	Two large patches

Conservation Status			Species Name	Last Record	Notes
Victoria	Melbourne	Boroondara			
		Endangered	<i>Carex appressa</i>	2004	
		Endangered	<i>Callistemon sieberi</i>	2004	3 found beside river, others planted
		Endangered	<i>Geranium</i> sp. 5	2004	Several found
		Endangered	<i>Gynatrix pulchella</i>	2004	2 naturally occurring, many planted
		Endangered	<i>Pseudognaphalium luteoalbum</i>	2004	
		Vulnerable	<i>Isolepis hookeriana</i>	2004	
		Vulnerable	<i>Isolepis inundata</i>	2004	
		Vulnerable	<i>Juncus pauciflorus</i>	2004	Very scarce
		Vulnerable	<i>Amyema quandang</i>	2004	At the works area
		Vulnerable	<i>Crassula helmsii</i>	2004	

Full flora list

The following table includes all species of indigenous plants and weeds found at the site during this study, categorised according to the two EVCs present. The column headed 'Woodland' is for the Floodplain Riparian Woodland and the column headed 'Wetland' is for the Floodplain Wetland Complex. In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Species with underlined names represent an important resource for collection of hard-to-get seed or cuttings.

Species Name	Woodland	Wetland	Species Name	Woodland	Wetland	Species Name	Woodland	Wetland
Indigenous species			<u><i>Lepidium pseudohyssopifolium</i></u>	✓		<i>Cirsium vulgare</i>	✓	
<i>Acacia dealbata</i>	D		<u><i>Lobelia pedunculata</i></u>	✓	✓	<i>Conium maculatum</i>	✓	
<i>Acacia mearnsii</i>	✓		<i>Lythrum hyssopifolia</i>	✓	✓	<i>Coprosma repens</i>	✓	
<i>Acacia melanoxylon</i>	✓		<i>Melaleuca ericifolia</i>	✓	✓	<i>Crataegus monogyna</i>	✓	
<i>Alisma plantago-aquatica</i>		✓	<i>Melicytus dentatus</i>	D	✓	<i>Cyperus eragrostis</i>	✓	
<i>Alternanthera denticulata</i>		M	<i>Microlaena stipoides</i>	✓		<i>Dactylis glomerata</i>	✓	
<i>Amyema quandang</i>	✓		<i>Muellerina eucalyptoides</i>	✓		<i>Ehrharta erecta</i>	✓	
<u><i>Callistemon sieberi</i></u>	✓		<i>Oxalis exilis/perennans</i>	✓		<i>Foeniculum vulgare</i>	✓	
<i>Carex appressa</i>		✓	<i>Persicaria decipiens</i>		✓	<i>Fraxinus angustifolia</i>	✓	
<i>Coprosma quadrifida</i>	M		<i>Persicaria praetermissa</i>		-	<i>Fumaria</i> sp.	✓	
<u><i>Crassula helmsii</i></u>		✓	<i>Persicaria prostrata</i>		-	<i>Galium aparine</i>	✓	
<i>Elatine gratioloides</i>		✓	<i>Persicaria subsessilis</i>		✓	<i>Gamochaeta calviceps</i>		✓
<u><i>Eleocharis sphacelata</i></u>		-	<i>Pseudognaphalium luteoalbum</i>	✓		<i>Holcus lanatus</i>	✓	
<i>Epilobium hirtigerum</i>		✓	<i>Senecio hispidulus</i>	✓		<i>Juncus articulatus</i>		✓
<i>Eucalyptus camaldulensis</i>	D		<i>Senecio quadridentatus</i>	✓		<i>Ligustrum lucidum</i>	✓	
<u><i>Eucalyptus ? × studleyensis</i></u>	-		<i>Triglochin procera</i>		✓	<i>Modiola caroliniana</i>	✓	
<i>Euchiton involucratus</i>	✓	✓	<i>Wolffia australiana</i>		✓	<i>Oxalis ?pes-caprae</i>	✓	
<i>Geranium</i> sp. 5	✓		Planted indigenous species			<i>Passiflora tarminiana</i>	✓	
<i>Gynatrix pulchella</i>	✓		<i>Acacia melanoxylon</i>	✓		<i>Prunus cerasifera</i>	✓	
<i>Hydrocotyle sibthorpioides</i>	✓	✓	<i>Goodenia ovata</i>	✓		<i>Rubus ?anglocandicans</i>	✓	
<i>Isolepis hookeriana</i>		✓	<i>Poa labillardierei</i>	✓		<i>Rumex conglomeratus</i>	✓	
<i>Isolepis inundata</i>		✓	<i>Acacia melanoxylon</i>	✓		<i>Salix babylonica s.l.</i>	✓	
<i>Isolepis</i> sp.		✓	<i>Callistemon sieberi</i>	✓		<i>Salix ? × rubens</i>	✓	
<i>Juncus amabilis</i>	✓	D	<i>Gynatrix pulchella</i>	✓		<i>Salpichroa origanifolia</i>	✓	
<i>Juncus bufonius</i>	✓	✓	<i>Ozothamnus ferrugineus</i>	✓		<i>Solanum mauritianum</i>	✓	
<i>Juncus gregiflorus</i>		M	<i>Poa labillardierei</i>	✓		<i>Solanum nigrum</i>	✓	
<i>Juncus pauciflorus</i>		-	Weed species			<i>Solanum pseudocapsicum</i>	✓	
<i>Juncus sarophorus</i>	✓	-	<i>Aster subulatus</i>	✓		<i>Sonchus asper glaucescens</i>	✓	
<i>Kunzea ericoides</i> spp. agg.	-		<i>Brassica fruticulosa</i>	✓		<i>Tradescantia fluminensis</i>	✓	
<i>Lachnagrostis filiformis</i>	M		<i>Bromus catharticus</i>	✓		<i>Ulmus aff. procera</i>	✓	
<i>Landoltia punctata</i>		✓	<i>Callitriche stagnalis</i>		✓	<i>Verbena bonariensis</i>	✓	
<i>Lemna disperma</i>		M						

Large old trees

Four trees at Kew Golf Club were found to qualify as large old trees according to the Department of Sustainability & Environment's criterion for Floodplain Riparian Woodland (i.e. trunk diameters of at least 0.8 m). These are each circled in yellow on the aerial photograph on p. 107, and include three River Red Gums (*Eucalyptus camaldulensis*) and one Studley Park Gum (*Eucalyptus ×studleyensis*). The health of two of these trees was good, one was fair to poor, and the last was not assessed.

There is also a River Red Gum beside the Yarra River and the ninth tee that has a plaque drawing attention to its value for habitat, as marked on the aerial photograph on p. 107. It is not as large as the trees just mentioned, but it includes hollows that are evidently used as nest sites.

Fauna of special significance

The significant fauna species in the list below have been observed at the Freeway Golf Course. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18). Obelisks (†) indicate species for which breeding has been confirmed within the golf course (mainly at Simpsons Lake).

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
Vulnerable	Secure	Occasional Visitor	Great Egret	1992
Vulnerable	Secure	Occasional Visitor	Royal Spoonbill	1992
Near Threatened	Secure	Endangered	†Nankeen Night Heron	2004
Near Threatened	Secure	Occasional Visitor	Pied Cormorant	1990
	Vulnerable	Critically Endangered	Peron's Tree Frog	1998
	Vulnerable	Vulnerable	Crested Pigeon	2004
	Rare	Endangered	†Darter	2004
		Extinct	†Stubble Quail	1960s
		Endangered	Victorian Smooth Froglet	1998
		Endangered	Striped Marsh Frog	2004
		Endangered	Southern Brown Tree Frog	2004
		Endangered	Water Rat	1989
		Endangered	†Great Cormorant	2004
		Endangered	Sacred Kingfisher	2004
		Endangered	Spotted Pardalote	2004
		Endangered	Crested Shrike-tit	1992
		Endangered	Dusky Woodswallow	1992
		Endangered	Red-browed Finch	2004
		Vulnerable	Common Long-necked Tortoise	2004
		Vulnerable	Weasel Skink	1992
		Vulnerable	†Little Pied Cormorant	2004
		Vulnerable	†Little Black Cormorant	2004
		Vulnerable	White-faced Heron	2004
		Vulnerable	Brown Goshawk	1989
		Vulnerable	Yellow-tailed Black-Cockatoo	1986
		Vulnerable	Musk Lorikeet	2001
		Vulnerable	Little Lorikeet	2004
		Vulnerable	Eastern Rosella	2004
		Vulnerable	Laughing Kookaburra	2004
		Vulnerable	Superb Fairy-wren	2004
		Vulnerable	White-browed Scrubwren	2004
		Vulnerable	New Holland Honeyeater	1992
		Vulnerable	Eastern Spinebill	1992
		Vulnerable	Eastern Yellow Robin	2004
		Vulnerable	Golden Whistler	2004
		Vulnerable	Grey Shrike-thrush	2004
		Vulnerable	Grey Fantail	2004
		Vulnerable	Black-faced Cuckoo-shrike	2004
		Vulnerable	Mistletoebird	2004
		Occasional Visitor	Black Swan	1992
		Occasional Visitor	Australasian Grebe	1992

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
		Occasional Visitor	Australian Pelican	1992
		Occasional Visitor	White-necked Heron	1992
		Occasional Visitor	Cattle Egret	1992
		Occasional Visitor	Straw-necked Ibis	1992
		Occasional Visitor	Yellow-billed Spoonbill	1992
		Occasional Visitor	Black-shouldered Kite	1992
		Occasional Visitor	Nankeen Kestrel	1992
		Occasional Visitor	Black-fronted Dotterel	1992
		Occasional Visitor	Fan-tailed Cuckoo	1989
		Occasional Visitor	Dollarbird	1988
		Occasional Visitor	Striated Pardalote	1989
		Occasional Visitor	Flame Robin	1992

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species and obelisks (†) indicate species for which breeding was confirmed.

Fish		Birds (continued)		Birds (continued)	
*Carp	1980	White-necked Heron	1992	White-browed Scrubwren	2004
		Great Egret	1992	Brown Thornbill	2004
Frogs		Cattle Egret	1992	Red Wattlebird	2004
Common Froglet	2004	†Nankeen Night Heron	2004	Brush Wattlebird	2001
Victorian Smooth Froglet	1998	Australian White Ibis	1992	Bell Miner	2004
Striped Marsh Frog	2004	Straw-necked Ibis	1992	†Noisy Miner	2004
Southern Brown Tree Frog	2004	Royal Spoonbill	1992	White-plumed Honeyeater	2004
Peron's Tree Frog	1998	Yellow-billed Spoonbill	1992	New Holland Honeyeater	1992
		Black-shouldered Kite	1992	Eastern Spinebill	1992
Reptiles		Brown Goshawk	1989	Flame Robin	1992
Common Long-necked Tortoise	2004	Nankeen Kestrel	1992	Eastern Yellow Robin	2004
Weasel Skink	1992	Purple Swamphen	2004	Crested Shrike-tit	1992
Tiger Snake	2004	†Dusky Moorhen	2004	Golden Whistler	2004
		Eurasian Coot	2004	Grey Shrike-thrush	2004
Mammals		Black-fronted Dotterel	1992	Restless Flycatcher	1989
Common Brushtail Possum	1996	Masked Lapwing	2004	†Magpie-lark	2004
Common Ringtail Possum	1992	Silver Gull	1992	Grey Fantail	2004
Water Rat	1989	*Rock Dove	2001	Willie Wagtail	2004
*Red Fox	1996	*Spotted Turtle-Dove	2004	Black-faced Cuckoo-shrike	2004
		Crested Pigeon	2004	Dusky Woodswallow	1992
Birds		Yellow-tailed Black-Cockatoo	1986	Grey Butcherbird	2004
†Stubble Quail		Galah	2004	†Australian Magpie	2004
Black Swan	1992	Sulphur-crested Cockatoo	2004	Pied Currawong	1992
Australian Wood Duck	2004	Rainbow Lorikeet	2004	Little Raven	2004
Pacific Black Duck	2004	Musk Lorikeet	2001	*House Sparrow	1989
Chestnut Teal	2004	Little Lorikeet	2004	*Eurasian Tree Sparrow	1989
Australasian Grebe	1992	Eastern Rosella	2004	Red-browed Finch	2004
†Darter	2004	Red-rumped Parrot	2004	*European Greenfinch	2004
†Little Pied Cormorant	2004	Fan-tailed Cuckoo	1989	*European Goldfinch	1989
Pied Cormorant	1990	Laughing Kookaburra	2004	Mistletoebird	2004
†Little Black Cormorant	2004	Sacred Kingfisher	2004	Welcome Swallow	2004
†Great Cormorant	2004	Dollarbird	1988	Silveryeye	2004
Australian Pelican	1992	Superb Fairy-wren	2004	*Common Blackbird	2004
White-faced Heron	2004	Spotted Pardalote	2004	†*Common Starling	2004
		Striated Pardalote	1989	*Common Myna	2004

Bird census results

Two twenty-minute bird censuses were carried out as part of the bird survey by David Lockwood on 12/11/04. The first was near the Yarra River, and recorded twenty-one species (including three introduced). The second census was around Simpsons Lake, and recorded fifteen native species (including nests of three cormorant species and the Darter) and no

introduced species. The species with the highest counts per census were Wood Duck (21), Little Black Cormorant (14, breeding), Darter (12, breeding) and Rainbow Lorikeet (9).

Fauna habitat

Simpsons Lake provides an excellent breeding ground for three cormorant species and the Australian Darter (*Anhinga melanogaster*). At the time of the survey there were four active nests of the Great Cormorant (*Phalacrocorax carbo*), nine active nests of the Little Black Cormorant (*Phalacrocorax sulcirostris*) and six active nests of the Little Pied Cormorant (*Phalacrocorax melanoleucos*). Dead trees within the lake as well as living Weeping Willows (*Salix babylonica*) on the fringes were utilised as breeding sites. Additionally, a Red-rumped Parrot (*Psephotus haematonotus*) was seen emerging from a hollow in one of the dead trees accompanied by its partner, but breeding could not be confirmed from the distance of the observation. Two Common Long-necked Tortoise (*Chelodina longicollis*) were also observed in the lake.

Chestnut Teal (*Anas castanea*) and Wood Duck (*Chenonetta jubata*) breed in the billabongs. Striped Marsh Frog (*Limnodynastes peronii*) calls were heard from the billabongs and Common Froglet (*Crinia signifera*) calls were heard just outside the boundary of the Golf Course.

River Red Gums and accompanying dense stands of Tree Violet (*Melicytus dentatus*) fringing the Yarra River and billabongs provide a somewhat secluded habitat in some areas for the Nankeen Night Heron (*Nycticorax caledonicus*), Red-browed Finch (*Emblema oculatum*) and Sacred Kingfisher (*Todiramphus sanctus*). The White-plumed Honeyeater appears to survive on a largely insectivorous diet and is found in the River Red Gums as opposed to the callistemons and planted eucalypts.

There are nest boxes in some trees to augment the natural nesting hollows.

According to the golf course manager, Tiger Snakes (*Notechis scutatus*) are observed occasionally on the course, no doubt venturing out from their usual aquatic and riparian habitat.

The fairways are utilised by species such as the Crested Pigeon (*Ocyphaps lophotes*) and Red-rumped Parrot, and the space above the fairways is used by Welcome Swallows (*Hirundo neoxena*). The aggressive Noisy Miner and Red Wattlebird feed on nectar from flowering callistemons and various non-indigenous eucalypts, but are thankfully in lower numbers compared to other sites in the City of Boroondara. The reason for this is not clear, but may be a result of the high diversity of planted tree species at this site, not many eucalypts flowering at the time of the survey and the fact that most of the shrub layer available is riparian.

A windbreak of Monterey Pine (*Pinus radiata*) along the northeastern boundary of the course (abutting Site 6) may be used as a roosting site by raptors such as the Australian Hobby (*Falco peregrinus*), but this was not observed during the time of the survey.

The Yarra River in or near the golf course is known to support Platypus, Water Rat, tortoises, many fish and other aquatic life. Glass Creek provides habitat for frogs and some fish, such as the migratory Common Galaxias and Broadfin Galaxias that have been found a short distance upstream (at the downstream limit of Hays Paddock).

Corridors

The Sacred Kingfisher and Mistletoebird that were seen during this study were almost certain to have reached the Kew Golf Club by means of the Yarra River corridor.

Darters and all three cormorant species were often observed to fly along the Yarra River or across country between the golf course and other sites along the Yarra River corridor, such as Willsmere Park. The Nankeen Night Heron was also observed crossing between the golf course and the main billabong at Hays Paddock, on the opposite side of the Eastern Freeway.

Site significance ratings

This site is part of the Department of Sustainability & Environment's BioSite number 5063, which extends along the Yarra River from Burke Rd to Chandler Hwy, on both sides of the river. The significance level given in the BioSites database is 'Regional', but this was based on information and criteria from the 1990s that are now obsolete. The following is an assessment against the current BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to this site.

BioSites criterion 1.1.2 attributes **Local** significance to 'Areas of 100 ha or more of contiguous native vegetation in a heavily fragmented landscape', which applies to the corridor of vegetation along the banks of the Yarra River (extending upstream and downstream of this site).

BioSites criterion 1.2.1 attributes **Regional** significance to colonial breeding or roosting sites with at least 5% of the bioregional population of any species present. Simpsons Lake probably meets this for several species, e.g. breeding colonies of 30 Nankeen Night Heron on 20/11/93 and 37 Darter on 17/3/95 (Beardsell 1997).

BioSites criterion 1.2.6 attributes **Regional** significance to links of regional-scale ecological corridors, which applies to this site because its vegetation and wetlands represent a component of the Yarra River corridor.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), any native vegetation belonging to an endangered EVC (including both EVCs on this site) has a conservation significance rating of either High or Very High. According to BioSites criterion 3.2.3, **State** significance applies to any site with a 'remnant patch' whose conservation significance is High or Very High due to the presence of a threatened EVC. This applies to the present site, noting that the size and native understorey cover of native vegetation in the site easily meets any reasonable definition of a remnant patch.

Rare or threatened plants

The single *Eucalyptus ×studleyensis* on the riverbank belongs to a taxon that is endemic to Victoria and is listed as endangered in Victoria. BioSites criterion 3.1.2 assigns **National** significance to 'All sites for a taxon listed as critically endangered or endangered and endemic to Victoria'. However, it should be understood that this particular taxon is a hybrid between two very common species, and it could reappear spontaneously even if it becomes extinct. Although the identity of this tree is not certain, the precautionary principle guides us not to diminish its significance for lack of certainty.

The site has a small population (approximately one dozen known plants) of *Lepidium pseudohyssopifolium*, which is listed by DSE (2005a) as suspected (but not confirmed) to be rare or threatened. BioSites criterion 3.1.2 attributes **Regional** significance to such a site, taking into account that the species is not endemic to Victoria.

The site also supports nineteen other species of plants that are threatened in Boroondara, varying from very scarce to abundant. Each one of the species with viable populations gives the site **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

The site supports a resident population of the Nankeen Night Heron, with records of up to thirty individuals seen on the property at one time. This species is listed by the Department of Sustainability & Environment as 'near threatened', a category which seems to have been overlooked in BioSites criteria 3.1.2 and 3.1.3 (noting that the lower threat category, 'rare', does lead to a significance rating). Treating this as an oversight, the population of Nankeen Night Herons at Kew Golf Club is here treated as a feature of **Regional** significance.

There are thirty-five other fauna species recorded from the golf course that are threatened in Boroondara. Some, such as the Darter and three species of cormorant, have viable populations that have bred there annually for many years. Each one of these species that has a viable population gives the site **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
<p>Environmental weeds, particularly woody weeds and weeds that smother the ground flora. The species of concern are:</p> <ul style="list-style-type: none"> • Serious: Desert Ash (<i>Fraxinus angustifolia</i>), Cleavers (<i>Galium aparine</i>), Carolina Mallow (<i>Modiola caroliniana</i>), Cherry-plum (<i>Prunus cerasifera</i>), Blackberry (<i>Rubus ?anglocandicans</i>), White Crack Willow (<i>Salix ?×rubens</i>), Wandering Jew (<i>Tradescantia fluminensis</i>); • Moderately serious: Aster-weed (<i>Aster subulatus</i>), Prairie Grass (<i>Bromus catharticus</i>), Water Starwort (<i>Callitriche stagnalis</i>), Spear Thistle (<i>Cirsium vulgare</i>), Hemlock (<i>Conium maculatum</i>), Mirror-bush (<i>Coprosma repens</i>), Hawthorn (<i>Crataegus monogyna</i>), Drain Flat-sedge (<i>Cyperus eragrostis</i>), Cocksfoot (<i>Dactylis glomerata</i>), Panic Veldt-grass 	All	Moderate	Current

Threat	Natural assets affected	Severity	When?
(<i>Ehrharta erecta</i>), Fennel (<i>Foeniculum vulgare</i>), unidentified fumitory (<i>Fumaria</i> sp.), Yorkshire Fog (<i>Holcus lanatus</i>), Jointed Rush (<i>Juncus articulatus</i>), Large-leafed Privet (<i>Ligustrum lucidum</i>), Soursob (<i>Oxalis ?pes-caprae</i>), Banana Passionfruit (<i>Passiflora tarminiana</i>), Clustered Dock (<i>Rumex conglomeratus</i>), Weeping Willow (<i>Salix babylonica</i> s.l.), Pampas Lily-of-the-Valley (<i>Salpichroa origanifolia</i>), Tobacco-bush (<i>Solanum mauritianum</i>), Madeira Winter-cherry (<i>Solanum pseudo-capsicum</i>), Common Elm (<i>Ulmus</i> aff. <i>procera</i>), Purple-top Verbena (<i>Verbena bonariensis</i>).			
Occupation of tree hollows by pests such as feral bees and Common Mynas.	Hollow-dependent native fauna	Moderate	Current
Soil erosion of the banks of the Yarra River during flood.	Floodplain Riparian Woodland; <i>Callistemon sieberi</i>	Moderate	Any major flood
Eucalypt dieback disease due to psyllids, leaf skeletonisers, leaf miners or galls. This threat is currently localised and is likely to occur more generally from time to time.	Floodplain Riparian Woodland; <i>Eucalyptus ×studleyensis</i> ; Hollow-bearing trees; Wildlife corridor	Locally Moderate	Current
Borer attack of Silver Wattles (<i>Acacia dealbata</i>).	Floodplain Riparian Woodland	Low	Current
Predation by foxes and cats. The remains of a Pacific Black Duck was found, indicating foxes or cats frequent the site.	Fauna	Low	Current
Mowing or herbicide use inadvertently destroying native flora.	Floodplain Riparian Woodland	Low	Potential
Populations of the aggressive Noisy Miner and Red Wattlebird may get out of ecological balance, as observed at other sites along the Yarra River.	Floodplain Riparian Woodland; birdlife; large old trees	Moderate	Potential
Eventual death of <i>Eucalyptus ×studleyensis</i> , with no younger trees to replace it.	<i>Eucalyptus ×studleyensis</i>	Moderate	Potential, long
Nutrient addition to soil and water in natural habitats from the golf course.	Both EVCs	Low	Potential

Past management and revegetation

Weeds have been reduced recently by a program of herbicide spraying and revegetation along the Yarra River. There is also a campaign to control Blackberry beside the billabong on the border with Greenacres Golf Course (Site 8).

Past plantings in the golf course have been with Australian native species rather than locally indigenous species.

Future revegetation

Depending upon the water levels during dry periods, it may be possible to revegetate edges of billabongs and Simpsons Lake with large aquatic species such as Tall Spike-rush (*Eleocharis sphacelata*), Stream Club-rush (*Bolboschoenus fluviatilis*) and River Club-rush (*Schoenoplectus tabernaemontani*). This may attract additional birds such as the Little Grassbird (*Megalurus gramineus*) and provide breeding habitat for species such as the Purple Swamphen (*Porphyrio porphyrio*).

Records should be kept of any indigenous species that are planted around the golf course.

Monitoring

The 'City of Boroondara Significant Tree Study' by John Patrick Pty Ltd (2001) provides a basis for rudimentary monitoring of the health of the River Red Gum listed by the National Trust (the 'Hoddle tree'). The photograph provided in that document is too poor to be useful, but the text says that 'There are some small sections of dead wood, and quite a

low foliage density, however the tree does not appear to be under any stress'. This was during a severe and very protracted drought. The author found that in 2004, the tree was in good health with normal foliage density (Photo 1 below).

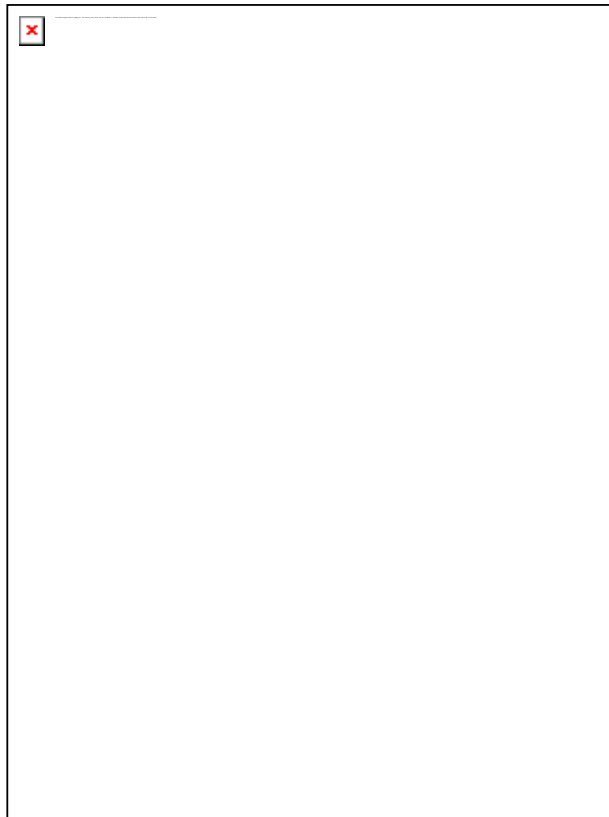
This only other pre-existing data suitable for ecological monitoring that was found in this study comprised records of breeding and roosting of Darter, Nankeen Night Heron and Little Pied Cormorant in the NEROC report (Beardsell 1997). Combined with the present study's observations, it can be concluded that the Darter and Little Pied Cormorant still breed at Simpsons Lake in similar numbers to the past, and that past observations of Nankeen Night Heron breeding were not duplicated in this study (which may be because the survey was very early in this species' breeding season).

The following items have been gathered to provide a baseline for future monitoring:

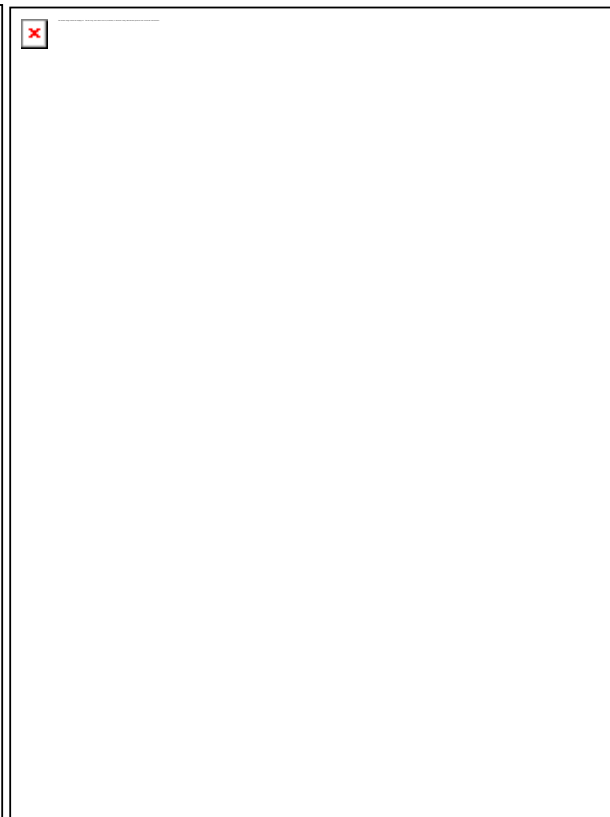
- Photographs as displayed on the next page, with locations and orientations marked on the aerial photograph on page 107. Original digital images are available separately. Repeat the photograph every few years. Check tree foliage density, the abundance of weeds and structural changes in the vegetation.
- The flora lists for the various parts of the site, as provided beneath the heading 'Full flora list' above.
- Ratings of weed severity within each part of the site, stored in the database of this study.
- Tree health ratings, as stored in the geographic information system data from this study and summarised above.
- Population sizes of the following significant plant species, each marked on the aerial photograph on page 107: *Callistemon sieberi* (six plants, two of them adjacent to each other at the most downstream location); *Lepidium pseudohyssopifolium* (approximately one dozen individuals beneath pines at the boundary with Site 6); and *Gynatrix pulchella* (two individuals beside the river near the 13th tee).
- Bird survey data, including the two twenty-minute bird censuses. Repeat in spring every two to four years. Check for changes in the abundance of birds, the particular species present and the species that are breeding.

Monitoring photographs for Kew Golf Club, taken on 12th November 2004

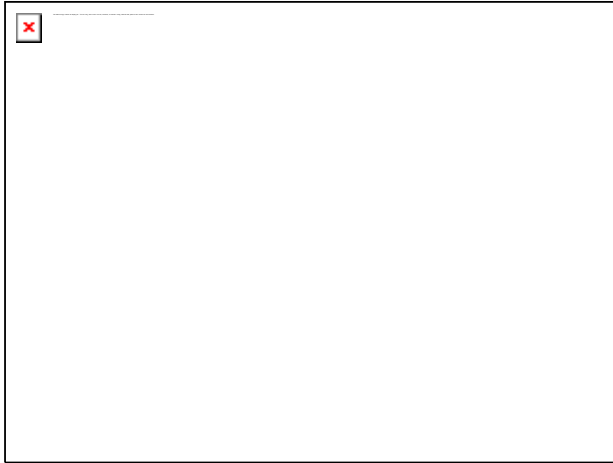
The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 107.



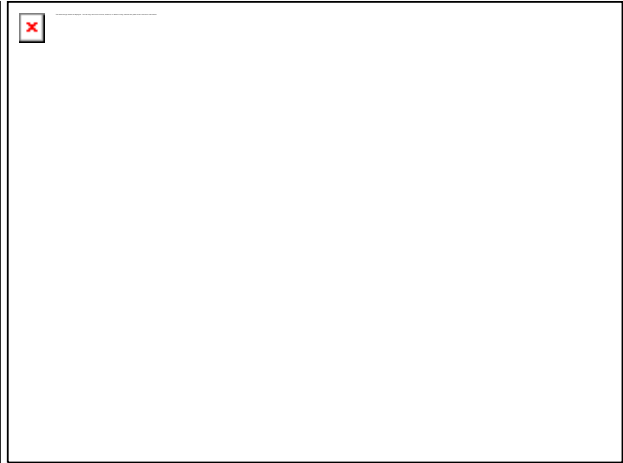
Site 7, Photo 1. The River Red Gum that is listed by the National Trust because it was used to mark a property boundary in Melbourne's first land sale in 1844. The purpose of the photograph is to show the tree's structure and the density of foliage in its crown.



Site 7, Photo 2. Upward view of the rare *Eucalyptus ×studleyensis* beside the 5th fairway, from the southeastern side of the trunk. This photograph is to show the condition and structure of the trunk and crown. The trunk girth is 3.25 m.



Site 7, Photo 3. A typical view of the vegetation beside the river (which is visible just right of centre). Note the density of the tree crowns.



Site 7, Photo 4. Looking north along the billabong abutting Greenacres Golf Course, to show the density of fringing vegetation and the luxuriance of tree crowns.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for six hours and forty minutes on 12th November 2004, using this study's standard approach described in Section 2.3. This included:
 - Description of the structural and floristic composition of the native vegetation;
 - Compilation of lists of indigenous and introduced plant species in each of five parts of the site, including the species' abundances and the threat level of all weed species in each area;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally, and similarly for localised infestations of serious weeds;
 - Individual measurement and assessment of large old trees (one of which could not be measured due to flooding);
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- A daytime bird survey of the whole site by David Lockwood on 12/11/04 according to the protocol discussed in Section 2.4.1, including two twenty-minute bird censuses;
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases;
- Additional information about rare birds from Cam Beardsell;
- Verbal information from the golf course manager, Adam Robertson;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Acknowledgment

Thanks to the golf course manager, Adam Robertson, for providing information and facilitating the site inspections.

Recommended further investigation

Recent floods raised the water level in the billabongs too high to allow thorough inspection in this study. A botanical survey of the billabongs should occur in a drier summer. Particular attention should be paid to the possibility that *Amphibromus fluitans* occurs in the billabong, as a billabong in Kew is the type locality for that species.

It would also be desirable to investigate whether the Glossy Grass Skink occurs around Swamp Paperbarks (*Melaleuca ericifolia*) within the site. If this is confirmed to be true or probable, advice should be taken about how to conserve this rare species.

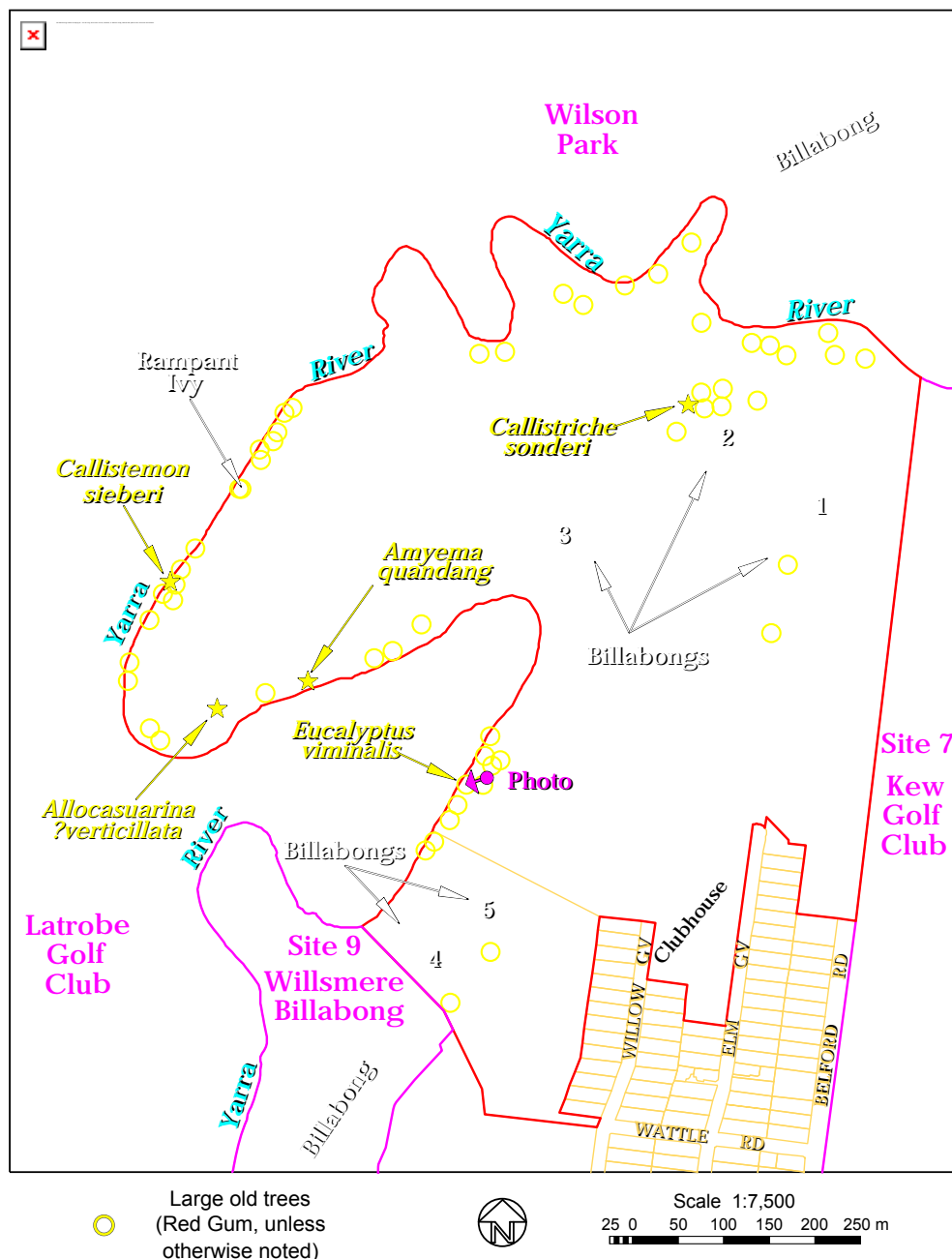
Site 8. Greenacres Golf Course, Kew East

Private golf course with native vegetation bordering the Yarra River and billabongs. Melway ref. 31 G12.

Site Biological Significance Level: *State*

Summary of significant natural assets:

- The endangered Ecological Vegetation Classes, Floodplain Riparian Woodland and Floodplain Wetland Complex;
- Viable populations of numerous species of flora and fauna that are threatened in Boroondara or in Melbourne;
- Part of a major ecological corridor along the Yarra River;
- At least fifty-six large old eucalypts (the highest tally of any site), in good to very good health on average.



Boundaries

The site of biological significance is taken here to be the whole golf course, as outlined in red above. Note that the fence between the golf course and Willsmere Park (Site 9) is well displaced from the title boundary given by Land Victoria.

Land use & tenure: Private golf course

Physical features

Site area: 47.0 hectares

Elevation: The normal water level for the Yarra River and water bodies is at an elevation of 6 m. The golf course is mostly on the floodplain at an elevation of approximately 10 m, but rises to approximately 27 m in the vicinity of the clubhouse in the southeastern corner.

Landform: Floodplain, riverbank and lower valley slope.

Slope: Land surrounding the river is generally flat, but slopes down sharply at the river. The area within approximately 200 m of the clubhouse is more sloping, with aspect varying between north (with a gradient of 1:25) to west (with a gradient of 1:12).

Soil type: The sloping land around the clubhouse originally had thin, light grey duplex soil, which has been modified by excavation. The rest of the site has brown to orange-brown, clayey deposits that have been washed down by the Yarra River as alluvium, or perhaps partly deposited in the ancient lake that once covered the area from Chandler Highway to Templestowe.

Underlying geology: The bedrock is Silurian sedimentary rock of the Dargile formation. However, apart from the clubhouse area (where there is no native vegetation), the bedrock is deeply buried under alluvium and does not materially influence the natural features of the site.

Site description

The principle reasons for Greenacres Golf Course being biologically significant are related to the billabongs and a narrow gallery of forest on the riverbank. The billabongs are numbered on the aerial photograph to aid discussion and listing of plant species.

The golf course has modified the floodplain's topography and the natural flood regime has been substantially altered. However, the remaining billabongs still represent quite significant habitat for flora and fauna. Each billabong and pond is different from the others, due to size, depth, intermittency of flooding, slope of the banks, history of excavation and the mowing regime around the banks. Each one supports at least one locally threatened plant species, mostly around the edges where periodic inundation occurs.

The billabongs were not occupied by the expected number of waterbirds on the day of the site inspection. This may be partly due to culling of birds, whose presence is not tolerated on Greenacres Golf Course as it is on other courses in Boroondara. Native vegetation fringing the billabongs is also tolerated less at this course than others, being heavily suppressed by herbicide and mowing. The combined effects of denuded banks and chemicals in the water can explain why the billabongs have less aquatic life generally than other billabongs along the Yarra River.

The vegetation beside the Yarra River is part of a much longer corridor of the endangered Floodplain Riparian Woodland. Its native ground flora has been mostly replaced by weeds or (quite recently) revegetation plots. Control of woody weeds has led to a lower prevalence of serious woody weeds than in most sites along the river, leaving no willows (*Salix* species) but still moderately serious infestations of Desert Ash (*Fraxinus angustifolia*) and Box Elder (*Acer negundo*). Smaller weeds now pose a higher threat, particularly in the cases of Drain Flat-sedge (*Cyperus eragrostis*), Ivy (*Hedera helix*) and Madeira Winter-cherry (*Solanum pseudocapsicum*).

The area within 300 m of the clubhouse is not particularly biologically significant, but the planted Australian native plants there and elsewhere around the course still provide habitat for substantial numbers of native birds.

Ecological links with other land

This site includes part of the almost unbroken corridor of vegetation that extends along the Yarra River upstream from Yarra Bend Park. The river and its vegetated fringe are arguably Melbourne's foremost ecological corridor. Native vegetation and billabongs on neighbouring sites and on the opposite side of the Yarra River (as seen on the aerial photograph) are critical for the ecological functioning of Greenacres Golf Course's flora and fauna.

Part of the ecological connection between these sites is severed by a high wire mesh fence abutting Site 9 (the Willsmere Park site). One or more Black Wallabies have been periodically seen within Sites 9, 10 and 11, but it (or they) could not get through the fence onto Greenacres Golf Club.

Habitat types

Water Body (No EVC number). Some billabongs provide open water habitat for fish, ducks and other aquatic life.

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion)

Approximately 2 ha occurs on the banks of the Yarra River and ½ ha occurs in patches around the billabongs. 25 indigenous plant species and 31 introduced plant species were found.

Canopy trees: An almost pure stand of *Eucalyptus camaldulensis*, to 30 m tall and >1 m trunk diameter, with crowns overlapping. There is also a solitary *Eucalyptus viminalis* subsp. *viminalis*.

Lower trees: *Acacia dealbata* is dense. Other species that would once have been present, such as *Melaleuca ericifolia*, have been cleared. The weeds, Box Elder (*Acer negundo*) and Desert Ash (*Fraxinus angustifolia*) are fairly abundant.

Shrubs: *Meliccytus dentatus* (= *Hymenanthera dentata*) is dense and typically 2-3 m tall. *Persicaria hydropiper* is also abundant and there are substantial numbers of *Coprosma quadrifida*. There is one plant of the characteristic species, *Callistemon sieberi*. The small but serious shrub weed, Madeira Winter-cherry (*Solanum pseudocapsicum*) is abundant.

Vines: *Calystegia sepium* was found in moderate numbers, although some (but not all) may be part of the *Calystegia sepium/silvatica* hybrid complex, as elsewhere along the Yarra River. The serious weed, Ivy (*Hedera helix*), is dense in places.

Ferns: None.

Ground flora: Heavily infested by weeds such as Ivy, Drain Flat-sedge (*Cyperus eragrostis*), Wandering Jew (*Tradescantia fluminensis*) and Cleavers (*Galium aparine*). The indigenous species include many plants of *Alternanthera denticulata* and *Juncus amabilis*, and lesser numbers of other species of *Juncus* and *Persicaria*, and the rare *Lepidium pseudohyssopifolium*.

Floodplain Wetland Complex (EVC 172, **regionally Endangered**), incorporating Billabong Wetland

Occurring in the five billabongs marked on the aerial photograph on page 119. Twenty-two indigenous plant species (excluding overhanging branches) and 12 introduced plant species were found.

Woody plants: Apart from overhanging branches, the only woody plants are small numbers of *Eucalyptus camaldulensis* at the edges.

Dominant species: The various billabongs are dominated by different herb species. *Alternanthera denticulata* and *Juncus amabilis* occur throughout, while *Juncus gregiflorus*, *Lemna disperma* and *Triglochin procera* are each present in five out of the six billabongs. Species of *Persicaria* are in some billabongs, but not as consistently as other sites along the Yarra River. Other characteristic species include *Crassula helmsii*, *Elatine gratioloides* and *Wolffia australiana*.

Flora of special significance

The conservation status ratings below (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Last Record	Notes
Melbourne	Boroondara			
Rare or threatened	Critically Endangered	<i>Carex gaudichaudiana</i>	2005	~7 m ² at billabong 3
Rare or threatened	Endangered	<i>Callitriche sonderi</i>	2005	Abundant at billabong 2
Rare or threatened	Vulnerable	<i>Elatine gratioloides</i>	2005	Numerous at billabong 4
Rare or threatened	Vulnerable	<i>Persicaria praetermissa</i>	2005	Two individuals
Rare or threatened	Vulnerable	<i>Persicaria prostrata</i>	2005	Numerous
Rare or threatened	Vulnerable	<i>Urtica incisa</i>	2005	Secure
Rare or threatened	Data Deficient	<i>Calystegia sepium</i>	2005	
Rare or threatened	Secure	<i>Wolffia australiana</i>	2005	
Rare or threatened	Secure	<i>Persicaria subsessilis</i>	2005	
	Critically Endangered	<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	2005	A single, large individual
	Endangered	<i>Allocasuarina ?verticillata</i>	2005	A single, large individual
	Endangered	<i>Callistemon sieberi</i>	2005	A single individual
	Endangered	<i>Pseudognaphalium luteoalbum</i>	2005	Scarce
	Endangered	<i>Senecio glomeratus</i>	2005	A single individual
	Vulnerable	<i>Juncus subsecundus</i>	2005	Very scarce
	Vulnerable	<i>Phragmites australis</i>	2005	A structural dominant
	Vulnerable	<i>Acaena novae-zelandiae</i>	2005	Four individuals
	Vulnerable	<i>Amyema quandang</i>	2005	Several individuals
	Vulnerable	<i>Crassula helmsii</i>	2005	Numerous
	Data Deficient	<i>Carex inversa</i>	2005	In the roughs

Full flora list

The following table includes all species of indigenous plants and weeds found at the site during this study, categorised according to their presence in either the Floodplain Riparian Woodland or any of the five billabongs that are numbered on the aerial photograph on page 119. In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Species with underlined names represent an important resource for collection of hard-to-get seed or cuttings.

Species Name	Woodland	Billabongs					Species Name	Woodland	Billabongs					Species Name	Woodland	Billabongs							
		1	2	3	4	5			1	2	3	4	5			1	2	3	4	5			
Indigenous species																							
<i>Acacia dealbata</i>	D						<i>Persicaria lapathifolia</i>	-							<i>Callitriche stagnalis</i>	✓	✓	✓	✓	✓			
<i>Acaena novae-zelandiae</i>			✓	✓			<i>Persicaria praetermissa</i>	-		-					<i>Cirsium vulgare</i>	-							
<i>Alisma plantago-aquatica</i>						-	<i>Persicaria prostrata</i>	✓	M	-					<i>Coprosma repens</i>	-							
<i>Allocasuarina</i> <i>?verticillata</i>	-						<i>Persicaria subsessilis</i>	✓							<i>Cynodon dactylon</i>	✓							
<i>Alternanthera denticulata</i>	M	✓	M	✓	✓	-	<i>Phragmites australis</i>		D						<i>Cyperus eragrostis</i>	M	M	M	M	M			
<i>Amyema quandang</i>	-						<i>Portulaca oleracea</i>	✓							<i>Ehrharta erecta</i>	✓							
<i>Callistemon sieberi</i>	-						<i>Pseudognaphalium</i> <i>luteoalbum</i>	-							<i>Euphorbia peplus</i>	✓							
<i>Callitriche sonderi</i>			M				<i>Senecio glomeratus</i>	-							<i>Foeniculum vulgare</i>	✓							
<i>Calystegia sepium</i>	✓						<i>Senecio glomeratus</i>	-							<i>Fraxinus angustifolia</i>	✓							
<i>Carex gaudichaudiana</i>				✓			<i>Triglochin procerum</i>		M	M	✓	-			<i>Fumaria</i> sp.	✓							
<i>Carex inversa</i>	✓						<i>Urtica incisa</i>	✓		✓					<i>Galium aparine</i>	✓							
<i>Coprosma quadrifida</i>	✓	✓	-				<i>Wolffia australiana</i>				✓				<i>Hedera helix</i>	✓							
<i>Cotula australis</i>	-						Planted indigenous species																
<i>Crassula helmsii</i>				✓	M	M	<i>Acacia dealbata</i>	✓							<i>Ipomoea indica</i>	✓							
<i>Elatine gratioloides</i>		✓	✓		M		<i>Acacia implexa</i>	✓							<i>Lepidium didymum</i>	-		-	-				
<i>Eucalyptus camaldulensis</i>	D	✓	✓	✓	✓	✓	<i>Acacia mearnsii</i>	✓							<i>Malva ?linnaei</i>	✓							
<i>Eucalyptus viminalis</i> <i>subsp. viminalis</i>	-						<i>Acacia verticillata</i>	✓							<i>Modiola caroliniana</i>	✓							
<i>Juncus amabilis</i>	M	D	-	D	✓	✓	<i>Einadia nutans</i>	✓							<i>Nasturtium officinale</i>	✓							
<i>Juncus gregiflorus</i>	-	-		✓	✓	D	<i>Eucalyptus camaldulensis</i>	✓							<i>Paspalum distichum</i>	✓	-	✓	✓	✓			
<i>Juncus subsecundus</i>							<i>Goodenia ovata</i>	✓							<i>Plantago lanceolata</i>	✓		✓					
<i>Lachnagrostis filiformis</i>	-						<i>Lomandra longifolia</i>	✓							<i>Populus alba</i>	✓	-						
<i>Lemma disperma</i>		M	✓	✓	✓		<i>Poa labillardierei</i>	✓							<i>Rubus ?anglocandicans</i>	✓							
<i>Meliccytus dentatus</i> s.l.	D	✓					<i>Pomaderris aspera</i>	✓							<i>Rumex conglomeratus</i>	✓			-	-			
<i>Microlaena stipoides</i>	✓						<i>Solanum laciniatum</i>	✓							<i>Salpichroa origanifolia</i>	✓							
<i>Muellerina eucalyptoides</i>	✓						<i>Wahlenbergia gracilis</i>	✓							<i>Solanum nigrum</i>	✓							
<i>Oxalis exilis/perennans</i>	-		✓		✓		Weed species																
<i>Persicaria decipiens</i>	✓	✓		✓	-		<i>Acer negundo</i>	✓							<i>Solanum pseudocapsicum</i>	✓	✓		-	-			
<i>Persicaria hydropiper</i>	D						<i>Aster subulatus</i>	-				-	-		<i>Sonchus asper</i>	✓							
							<i>Atriplex prostrata</i>	✓							<i>Tradescantia fluminensis</i>	✓							
							<i>Bromus catharticus</i>	-							<i>Verbena bonariensis</i>	✓							
															<i>Zantedeschia aethiopica</i>	-	-						

Large old trees

A highlight of this site is that it has more large River Red Gums (*Eucalyptus camaldulensis*) than any other site in Boroondara, and in better health than most other sites.

Fifty-five River Red Gums were found to qualify as large old trees according to the Department of Sustainability & Environment's criterion for Floodplain Riparian Woodland (i.e. trunk diameters of at least 0.8 m). These are each circled in yellow on the aerial photograph on p. 119. Some could not be measured for safety reasons, and only the first twenty-two were fully assessed (due to time constraints). The largest trunk diameter measurement was 1.33 m. The trees' health ratings were as follows:

Health Rating:	Very Good	Good	Fair to Good	Fair	Poor	Not assessed
Number of trees:	8	11	2	1	0	33

In addition to these River Red Gums, the site's only Manna Gum (*Eucalyptus viminalis* subsp. *viminalis*, pictured at right) qualifies as a 'large old tree' with a trunk diameter of 1.70m – one of the largest trees in Boroondara, regardless of species. This subspecies is also critically endangered in Boroondara, with perhaps fewer than one dozen individuals in the municipality.

Unfortunately, the health of this tree is only fair to good. The advice of an arborist with experience in care of very old Manna Gums is recommended.

The very large Manna Gum beside the dog-leg in the 12th fairway. The photograph is taken from within a depression at the location marked on the aerial photograph. The Yarra River is ten metres beyond the tree. The purpose of the photograph is for monitoring the tree's health and structure.



Fauna of special significance

The significant fauna species in the list below have been observed at the Greenacres Golf Course. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
Near Threatened	Vulnerable	Occasional Visitor	Azure Kingfisher	1997
	Near Threatened	Endangered	Platypus	2000
		Endangered	Victorian Smooth Froglet	1988
		Endangered	Striped Marsh Frog	1994
		Endangered	Southern Brown Tree Frog	1994
		Endangered	Verreaux's Tree Frog	1988
		Endangered	Water Rat	1991
		Endangered	Crimson Rosella	1988
		Endangered	Sacred Kingfisher	2005
		Vulnerable	Common Long-necked Tortoise	2005
		Vulnerable	Weasel Skink	1988
		Vulnerable	Little Pied Cormorant	2005
		Vulnerable	Little Black Cormorant	2005
		Vulnerable	Yellow-tailed Black-Cockatoo	1997
		Vulnerable	Musk Lorikeet	2005
		Vulnerable	Eastern Rosella	2005
		Vulnerable	Tawny Frogmouth	1988
		Vulnerable	Laughing Kookaburra	2005
		Vulnerable	Superb Fairy-wren	2005
		Vulnerable	White-browed Scrubwren	2005
		Vulnerable	Grey Fantail	2005
		Data Deficient	Little Forest Bat	1987
		Occasional Visitor	Australian Pelican	2002
		Occasional Visitor	Striated Pardalote	2005

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
		Occasional Visitor	White-naped Honeyeater	2005

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species and obelisks (†) indicate species for which breeding was confirmed.

Butterflies		Birds		Birds (continued)	
*Cabbage White	2005	Australian Wood Duck	2005	Sacred Kingfisher	2005
Australian Admiral	2005	Pacific Black Duck	2005	Superb Fairy-wren	2005
Australian Painted Lady	2005	Chestnut Teal	2005	Striated Pardalote	2005
Common Brown	2005	Little Pied Cormorant	2005	White-browed Scrubwren	2005
		Little Black Cormorant	2005	Brown Thornbill	1988
Fish		Australian Pelican	2002	Bell Miner	1988
*Carp	2005	†Australian White Ibis	2005	Noisy Miner	2005
		†Dusky Moorhen	2005	White-plumed Honeyeater	1988
Frogs		Masked Lapwing	2005	White-naped Honeyeater	2005
Common Froglet	1994	*Spotted Turtle-Dove	2005	Magpie-lark	2005
Victorian Smooth Froglet	1988	Yellow-tailed Black-Cockatoo	1997	Grey Fantail	2005
Striped Marsh Frog	1994	Long-billed Corella	2005	Willie Wagtail	2005
Southern Brown Tree Frog	1994	Sulphur-crested Cockatoo	2005	Grey Butcherbird	2005
Verreaux's Tree Frog	1988	Rainbow Lorikeet	2005	†Australian Magpie	2005
		Musk Lorikeet	2005	Little Raven	2005
Reptiles		Crimson Rosella	1988	†Welcome Swallow	2005
Common Long-necked Tortoise	2005	Eastern Rosella	2005	Silvereye	1988
Weasel Skink	1988	Red-rumped Parrot	2005	*Common Blackbird	1988
		Azure Kingfisher	1997	*Common Starling	1988
Mammals		Laughing Kookaburra	2005	*Common Myna	2005
Platypus	2000				
Little Forest Bat	1987				
Water Rat	1991				

Fauna habitat

River Red Gums and accompanying dense stands of Tree Violet (*Melicytus dentatus*) fringing the Yarra River and billabongs provide a somewhat secluded habitat in some areas for birds such as the Superb Fairy-wren, White-browed Scrubwren and Grey Fantail. The White-plumed Honeyeater appears to survive on a largely insectivorous diet and is found in the River Red Gums as opposed to the planted Australian native species.

The fairways are utilised by species such as the Crested Pigeon (*Ocyphaps lophotes*) and Red-rumped Parrot, and the space above the fairways is used by Welcome Swallows (*Hirundo neoxena*).

As noted under the heading, 'site description', the billabongs did not display the expected diversity of wildlife, and this may be due to the effects of chemical contamination, destruction of fringing vegetation and possible culling of birds.

The Yarra River in this vicinity is known to support Platypus, Water Rat, tortoises, many fish and other aquatic life.

Corridors

The Sacred Kingfisher and Grey Fantail that were observed during this study were almost certain to have reached the Greenacres Golf Course by means of the Yarra River corridor. The same would be true of the Platypus, Azure Kingfisher and Australian Pelican recorded previously.

Darters and three cormorant species were often observed to fly towards or over Greenacres Golf Course while the author was inspecting neighbouring sites along the Yarra River.

Site significance ratings

This site is part of the Department of Sustainability & Environment's BioSite number 5063, which extends along the Yarra River from Burke Rd to Chandler Hwy, on both sides of the river. The significance level given in the BioSites database is 'Regional', but this was based on information and criteria from the 1990s that are now obsolete. The following is an assessment against the current BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to ‘All parts of riparian systems with riparian vegetation present’, which applies to this site.

BioSites criterion 1.1.2 attributes **Local** significance to ‘Areas of 100 ha or more of contiguous native vegetation in a heavily fragmented landscape’, which applies to the corridor of vegetation along the banks of the Yarra River (extending upstream and downstream of this site).

BioSites criterion 1.2.6 attributes **Regional** significance to links of regional-scale ecological corridors, which applies to this site because its vegetation and wetlands represent a component of the Yarra River corridor.

Regionally threatened Ecological Vegetation Class

According to the criteria of ‘Victoria’s Native Vegetation Management – A Framework for Action’ (NRE 2002a), any native vegetation belonging to an endangered EVC (including both EVCs on this site) has a conservation significance rating of either High or Very High. According to BioSites criterion 3.2.3, **State** significance applies to any site with a ‘remnant patch’ whose conservation significance is High or Very High due to the presence of a threatened EVC. This applies to the present site, noting that the size and native understorey cover of native vegetation in the site easily meets any reasonable definition of a remnant patch.

Rare or threatened plants

The site supports twenty species of plants that are threatened in Boroondara, varying from very scarce to abundant. Each one of the species with viable populations gives the site **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

There are thirty-five fauna species recorded from the golf course that are threatened in Boroondara, one of which (the Azure Kingfisher) is listed as ‘near threatened’ throughout Victoria. At least one of these species (the White-browed Scrubwren) has a viable population. Any locally threatened species that has a viable population gives the site **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of Victoria’s Native Vegetation Framework (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site’s ecological values are presented in a form to suit the Department of Sustainability & Environment’s ‘BioSites’ database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Drain Flat-sedge (<i>Cyperus eragrostis</i>), Ivy (<i>Hedera helix</i>), Madeira Winter-cherry (<i>Solanum pseudocapsicum</i>); • Moderately serious: Box Elder (<i>Acer negundo</i>), Hastate Orache (<i>Atriplex prostrata</i>), Prairie Grass (<i>Bromus catharticus</i>), Water Starwort (<i>Callitriche stagnalis</i>), Mirror-bush (<i>Coprosma repens</i>), Couch (<i>Cynodon dactylon</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Fennel (<i>Foeniculum vulgare</i>), Desert Ash (<i>Fraxinus angustifolia</i>), unidentified fumitory (<i>Fumaria</i> sp.), Cleavers (<i>Galium aparine</i>), Yorkshire Fog (<i>Holcus lanatus</i>), Lear’s Morning-glory (<i>Ipomoea indica</i>), Watercress (<i>Nasturtium officinale</i>), Water Couch (<i>Paspalum distichum</i>), Ribwort (<i>Plantago lanceolata</i>), White Poplar (<i>Populus alba</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Clustered Dock (<i>Rumex conglomeratus</i>), Pampas Lily-of-the-Valley (<i>Salpichroa organifolia</i>), Black Nightshade (<i>Solanum nigrum</i>), Wandering Jew (<i>Tradescantia fluminensis</i>), Purple-top Verbena (<i>Verbena bonariensis</i>). 	All	Moderate	Current
Mowing and herbicide destroying native flora, particularly around the billabongs.	Floodplain Riparian Woodland; fauna habitat	Moderate	Current

Threat	Natural assets affected	Severity	When?
Culling of waterbirds.	Birdlife	Unknown	Current
Occupation of tree hollows by pests such as feral bees and Common Mynas.	Hollow-dependent native fauna	Moderate	Current
Soil erosion of the banks of the Yarra River during flood.	Floodplain Riparian Woodland; <i>Callistemon sieberi</i>	Moderate	Any major flood
Eucalypt dieback disease due to psyllids, leaf skeletonisers, leaf miners or galls. This threat is currently localised and is likely to occur more generally from time to time.	Floodplain Riparian Woodland; Hollow-bearing trees; Wildlife corridor	Locally Moderate	Current
Borer attack of Silver Wattles (<i>Acacia dealbata</i>).	Floodplain Riparian Woodland	Low	Current
Predation by foxes and cats. Remains of birds have been found at neighbouring sites.	Fauna	Low	Current
Populations of the aggressive Noisy Miner and Red Wattlebird may get out of ecological balance, as observed at other sites along the Yarra River.	Floodplain Riparian Woodland; birdlife; large old trees	Moderate	Potential
Nutrient addition to soil and water in natural habitats from the golf course.	Both EVCs	Low	Potential

Past management and revegetation

Weeds have been reduced recently by a program of herbicide spraying and revegetation along the Yarra River.

Removal of native vegetation beside the billabongs appears to be substantially reducing the habitat available for waterbirds and aquatic life generally.

Past plantings in the golf course have been with Australian native species rather than locally indigenous species.

Priority actions

1. Obtain an assessment of the Manna Gum beside the 12th fairway from an arborist who has good experience with veteran indigenous eucalypts, seeking advice about conserving this extremely significant tree;
2. Control Ivy at the riverbank location beside the 14th fairway where a serious infestation is marked on the aerial photograph (page 119);
3. Remove the soil and logs that have been dumped at the base of the large old tree on the riverbank at MGA coordinates, 328050 metres east, 5816760 metres north.

Monitoring

This study found no pre-existing data suitable for ecological monitoring.

The following items have been gathered to provide a baseline for future monitoring:

- The photograph of the Manna Gum displayed on page 123, whose location and orientation is marked on the aerial photograph on page 119. An original digital image is available separately. Repeat the photograph every few years. Check the tree's structure and crown density.
- The flora lists for the various parts of the site, as provided beneath the heading 'Full flora list' above.
- Ratings of weed severity within each part of the site, stored in the database of this study.
- Tree health ratings, as stored in the geographic information system data from this study and summarised above.
- Population sizes of the following significant plant species, each marked on the aerial photograph on page 107: *Callistemon sieberi* (one plant); *Callitriche sonderi* (abundant in billabong 2); and *Carex gaudichaudiana* (13 m × ½ m on the northern bank of billabong 3).
- Bird survey, with abundances stored in this study's fauna database. Repeat in spring at least every five years. Check for changes in the abundance of birds, the particular species present and the species that are breeding.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for nine hours and fifty minutes on 10th January 2005, using this study's standard approach described in Section 2.3. This included:
 - Description of the structural and floristic composition of the native vegetation;
 - Compilation of lists of indigenous and introduced plant species in each of seven parts of the site, including the species' abundances and the threat level of all weed species in each area;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally, and similarly for localised infestations of serious weeds;
 - Individual measurement and health assessment of large old trees;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Verbal information from golf course members and staff;
- Aerial photography from August 2004;
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

No additional investigation is recommended for the Greenacres Golf Course.

Acknowledgment

Thanks to the golf course management for allowing and facilitating the site inspection, and to staff and members who have provided information about the site's natural assets.

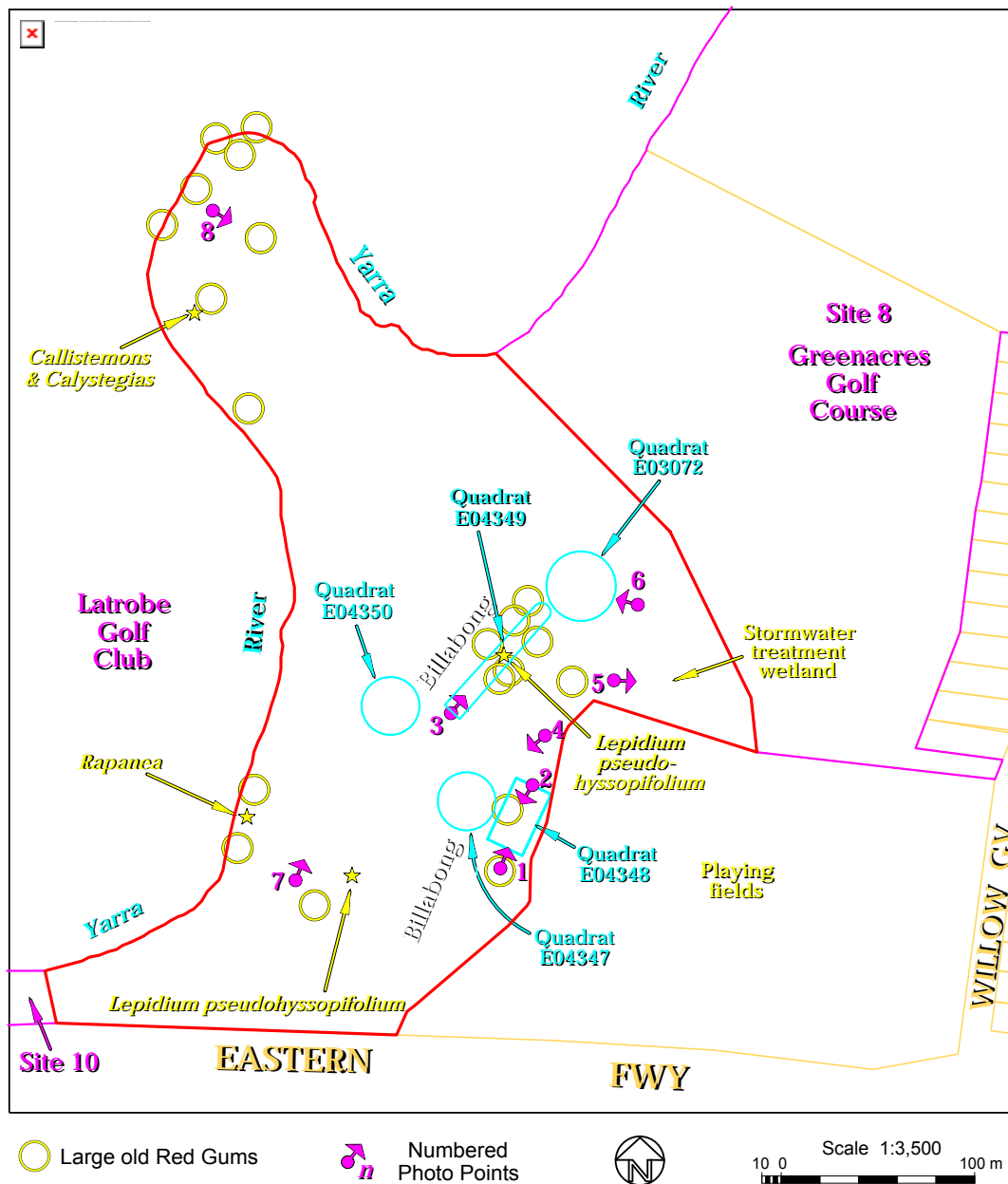
Site 9. Willsmere Park, Kew East

Public parkland beside the Yarra River, with woodland, forest and billabong. Melway ref. 45 F1.

Site Biological Significance Level: *State*

Summary of significant natural assets:

- The billabong bank includes vegetation with the highest habitat quality score of any site in this study, and it belongs to the endangered Ecological Vegetation Class, Floodplain Riparian Woodland;
- The other Ecological Vegetation Class present is Floodplain Wetland Complex, which is also endangered;
- There are viable populations of many species of flora and fauna that are threatened in Boroondara or Melbourne;
- The site is a node on a major ecological corridor along the Yarra River.



Boundaries

The site is outlined in red on the aerial photograph. The boundary mostly coincides with the cadastral boundary of 27 Willow Grove, Kew East (the Willsmere Park property). The only exception is in the southeast around the playing fields,

where the boundary follows a footpath and an east-west swale. Note that the fence of Greenacres Golf Course is well displaced from the title boundary given by Land Victoria.

Land use & tenure: Parkland belonging to the City of Boroondara, for recreation, nature conservation, drainage purposes and unpowered transport along the Main Yarra Trail.

Physical features

Site area: 7.5 hectares

Elevation: The normal water level for the Yarra River and billabong is at an elevation of 6 m. The elevation of the floodplain is approximately 10 m.

Landform: Floodplain, riverbank and billabong.

Slope: The floodplain is generally flat, but slopes down sharply at the river and the southern and eastern banks of the billabong.

Soil type: Brown to orange-brown, clayey deposits that have been washed down by the river as alluvium, or perhaps partly deposited in the ancient lake that once covered the area from Chandler Highway to Templestowe.

Underlying geology: The bedrock is Silurian sedimentary rock of the Dargile formation. However, the bedrock is deeply buried and does not materially influence the natural features of the site.

Site description

This site's native vegetation and billabong (known variously as Willsmere Billabong or Kew Billabong) represent one of the most biologically significant sites in Boroondara.

The main feature is that the site has the municipality's most ecologically intact representation of the endangered Ecological Vegetation Class (EVC), Floodplain Riparian Woodland, complete with many flora and fauna species that are rare or threatened in Boroondara or more widely. In addition, the billabong itself may be one of Boroondara's most ecologically intact representations of another endangered EVC, Floodplain Wetland Complex, but floodwater prevented detailed assessment during this study.

The site's natural assets have also been subject to more study than almost anywhere else in Boroondara outside Yarra Bend Park. In 1998, G.W. Carr and C. Orscheg prepared a report for EDAW (Aust) Pty Ltd on '*Flora and Fauna Values and Management Issues, Willsmere Billabong, North Kew*'. Fauna surveys were also conducted for the NEROC report of Beardsell (1997), and bird observers have often recorded sightings at the billabong. This level of attention reflects that the Willsmere Billabong is Boroondara's most ecologically intact billabong that is publicly accessible (most other billabongs being within golf courses).

Correspondingly, the site receives a significant proportion of the effort that the City of Boroondara puts into bushland management. This is assisted by the volunteer group, Friends of Willsmere Park & Kew Billabong inc.

The northern half of the site has a gallery of Floodplain Riparian Woodland on the riverbank, surrounding mown parkland with planted Australian native species and very few indigenous plants. This area is popular with dog walkers, many of whom access the Yarra River at the site's northern tip.

The riverbank's Floodplain Riparian Woodland is part of a much longer corridor that extends from Yarra Bend Park to well upstream of Boroondara, with only minor interruptions. Its native ground flora has been mostly replaced by weeds or (quite recently) revegetation plots. Woody weeds have been extensively removed, leaving no willows (*Salix* species) or Box Elder (*Acer negundo*). However, there are still very serious infestations of Wandering Jew (*Tradescantia fluminensis*), Madeira Winter-cherry (*Solanum pseudocapsicum*) and the grass weeds, Panic Veldt-grass (*Ehrharta erecta*) and Kikuyu (*Pennisetum clandestinum*).

The southern half of the site has predominantly native vegetation and a billabong that may be empty for years and then full for more than a year at a time. However, the natural cycle of flooding and drying has sometimes been altered by pumping water into or out of the billabong. The billabong embraces a peninsula that was found to have the highest habitat score (74%) of any native vegetation examined in this study (see below).

When the billabong contains water, it provides good habitat for a range of wetland fauna, particularly waterbirds. Most of the more significant waterbirds, such as the Nankeen Night Heron, are shy and easily frightened off by humans or pets. Because the billabong is so popular for dog walking, the rarer waterbirds are unlikely to breed there and instead can be found doing so at nearby Kew Golf Club (where there are no pets and less human disturbance).

A stormwater treatment wetland was recently constructed immediately east of the billabong to inhibit pollution of the billabong's water by stormwater and litter. It has been planted with indigenous species and is serving as valuable habitat, even for Platypus.

Ecological links with other land

This site includes part of the almost unbroken corridor of vegetation that extends along the Yarra River upstream from Yarra Bend Park. The river and its vegetated fringe are arguably Melbourne's foremost ecological corridor. Native vegetation and billabongs on neighbouring sites and on the opposite side of the Yarra River are critical for the ecological functioning of Willsmere Park's flora and fauna.

Habitat types

Water Body (No EVC number). Seasonally, the billabong provides open water habitat for fish, ducks and other aquatic life.

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion)

Approximately 3 ha along the riverbank and around the billabong, comprising 38 wild indigenous plant species, 42 planted species and 74 introduced plant species (the tallies aggregated from three studies).

Canopy trees: A pure stand of *Eucalyptus camaldulensis*, 25-30 m tall and >1 m trunk diameter at maturity, with crowns overlapping.

Lower trees: Naturally occurring plants of *Acacia dealbata* are dense. *Acacia melanoxylon* is represented by substantial numbers of natural individuals as well as planted specimens. *Acacia mearnsii* and *Melaleuca ericifolia* are moderately common, but the former is mostly due to planting. The characteristic species, *Rapanea howittiana*, is represented by one semi-mature individual and a seedling, and while they are on the edge of a revegetation area, the author's inquiries found no evidence of them being planted. It is not clear whether the *Acacia implexa* recorded by Carr and Orscheg in 1998 were planted or not, but the present population appears to be.

Shrubs: *Melicytus dentatus* (= *Hymenanthera dentata*) and *Coprosma quadrifida* are dense and typically 2-3 m tall. *Bursaria spinosa* is localised but in substantial numbers, partly due to planting. There is a patch of approximately fifteen of the characteristic species, *Callistemon sieberi*. *Goodenia ovata* is present, at least some of which is due to planting. *Persicaria hydropiper* is also abundant. The small but serious shrub weed, Madeira Winter-cherry (*Solanum pseudocapsicum*) is abundant.

Shrubby herbs: *Senecio minimus* is localised but in substantial numbers. *Persicaria lapathifolia* is presently abundant beside the Yarra River, but numbers will rise and fall markedly. *Urtica incisa* has been recorded previously and is likely to reappear following floods.

Vines: Members of the *Calystegia sepium/silvatica* hybrid complex occur with the *Callistemon sieberi* in the northwest, but it was not possible to tell whether any pure indigenous plants occur. *Rubus parvifolius* is present in substantial numbers (the site being the stronghold of this species in Boroondara). The weed, Ivy (*Hedera helix*), is dense in places.

Ferns: None.

Ground flora: Heavily infested by weeds, particularly Wandering Jew (*Tradescantia fluminensis*) and Cleavers (*Galium aparine*). The indigenous species include many plants of *Alternanthera denticulata* and *Juncus amabilis*, and lesser numbers of other species of *Juncus* and *Persicaria*, and the rare *Lepidium pseudohyssopifolium*. There are also several of the characteristic species, *Geranium* sp. 5.

Floodplain Wetland Complex (EVC 172, **regionally Endangered**), incorporating Billabong Wetland

Occupies approximately 1.4 ha, in the billabong, comprising 28 indigenous plant species (excluding overhanging branches), 1 planted species and 35 introduced plant species (the tallies aggregated from three studies).

Woody plants: Confined to some patches of young *Eucalyptus camaldulensis* and overhanging branches from the Floodplain Riparian Woodland.

Dominant species: Dominated at the time of the 2004-5 survey by Common Duckweed, *Lemna disperma*. The other floating plants, *Azolla filiculoides* and *Wolffia australiana* were also present. These floating species will vary in density from time to time. The more persistent species that are abundant are *Alternanthera denticulata*, *Juncus amabilis*, various *Persicaria* species and *Triglochin procera*. Less abundant characteristic species include *Alisma plantago-aquatica*, *Callitriche sonderi*, *Centipeda ?elatinooides*, *Elatine gratiolooides*, *Eleocharis sphacelata* and *Phragmites australis*.

Habitat Score

Habitat scoring by the 'habitat hectare' method (Section 2.3.4, page 13) was conducted within two areas of Floodplain Riparian Woodland corresponding to Quadrats E04348 and E04349 marked on the aerial photograph on page 128. The ecological condition within each of these areas is fairly uniform.

The habitat score for quadrat E04348, on the southeastern bank of the billabong, was 55%.

The habitat score for quadrat E04349, on the northern end of the peninsula at the centre of the billabong, was 74%. This is by far the highest habitat score found anywhere during this study, but note that the parts of Yarra Bend Park

within Boroondara were not assessed. The score includes 13 percentage points for lack of weeds, which can be credited to the complete death of a carpet of Wandering Jew (*Tradescantia fluminensis*) in recent floods. This weed is likely to recover and consequently reduce the habitat score.

Flora of special significance

The only plant species recorded at the site which the Department of Sustainability & Environment lists as rare or threatened throughout Victoria is *Lepidium pseudohyssopifolium*. This species is listed as data deficient in Victoria, which means that the species is suspected to be rare or threatened but that there is too little information available to be confident. The other conservation status ratings in the table below (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Obelisks (†) next to the year of the latest record indicate species that live on billabong floors and would have escaped detection in the present study due to flooding.

Conservation Status		Species Name	Last Record	Notes
Melbourne	Boroondara			
Rare or threatened	Endangered	<i>Lepidium pseudohyssopifolium</i>	2005	Approximately six plants
Rare or threatened	Critically Endangered	<i>Callitriche ?sonderi</i>	1998†	Abundant in 1998
Rare or threatened	Critically Endangered	<i>Centipeda ?elatinooides</i>	1998†	Abundant in 1998
Rare or threatened	Critically Endangered	<i>Leptospermum obovatum</i>	2005	Abundant in 1998, scarce in 2005
Rare or threatened	Critically Endangered	<i>Lycopus australis</i>	1998	Abundant in 1998, absent in 2005
Rare or threatened	Critically Endangered	<i>Rapanea howittiana</i>	2005	One mature and one seedling
Rare or threatened	Critically Endangered	<i>Rumex bidens</i>	1998†	Abundant in 1998
Rare or threatened	Vulnerable	<i>Elatine gratioloides</i>	1998†	Scarce in 1998
Rare or threatened	Vulnerable	<i>Persicaria praetermissa</i>	2005	Abundant
Rare or threatened	Vulnerable	<i>Persicaria prostrata</i>	1998	Scarce in 1998
Rare or threatened	Vulnerable	<i>Urtica incisa</i>	1998	Scarce in 1998
Rare or threatened	Vulnerable	<i>Ricciocarpos natans</i>	1998	Abundant in 1998, absent in 2005
Rare or threatened	Data Deficient	<i>Calystegia ?sepium</i>	2005	1 small patch; ID 60% confident
Rare or threatened	Secure	<i>Wolffia australiana</i>	2005	Abundant in 2005
Rare or threatened	Secure	<i>Persicaria subsessilis</i>	2005	Abundant in 2005
	Critically Endangered	<i>Centella cordifolia</i>	1998†	Scarce in 1998
	Critically Endangered	<i>Euchiton involucrat</i>	1998	Scarce in 1998, absent in 2005
	Critically Endangered	<i>Rubus parvifolius</i>	2005	A substantial population
	Critically Endangered	<i>Rumex brownii</i>	2005	Four individuals, on the peninsula
	Endangered	<i>Carex appressa</i>	2005	A viable population
	Endangered	<i>Callistemon sieberi</i>	2005	c. 15 old individuals, also planted
	Endangered	<i>Geranium</i> sp. 5	2005	Several plants were found
	Endangered	<i>Pseudognaphalium luteoalbum</i>	1998	Scarce in 1998, absent in 2005
	Endangered	<i>Senecio minimus</i>	2005	At least ten individuals found
	Endangered	<i>Solanum laciniatum</i>	1998	Scarce in 1998, absent in 2005
	Vulnerable	<i>Juncus ?subsecundus</i>	1998	Possibly misidentified
	Vulnerable	<i>Phragmites australis</i>	2005	Secure
	Vulnerable	<i>Acaena novae-zelandiae</i>	1998	Not scarce in 1998, absent in 2005
	Vulnerable	<i>Goodenia ovata</i>	2005	Wild plants are scarce

Full flora list

The following table includes all species of indigenous plants (naturally occurring and planted) and weeds recorded at the site. Their areas of occurrence have been subdivided into either the Floodplain Riparian Woodland or the billabong, condensed from twelve primary lists. In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found during at least one study; a tick indicates moderate numbers; and '-' means that very few plants have ever been found. Species with underlined names represent good resources for collection of seed or cuttings.

Species Name	Woodland Wetland	Species Name	Woodland Wetland	Species Name	Woodland Wetland
Indigenous species (not planted)		<i>Acacia implexa</i>	✓	<i>Acaena novae-zelandiae</i>	-
<i>Acacia dealbata</i>	D	<i>Acacia mearnsii</i>	✓	<i>Alisma plantago-aquatica</i>	-
		<i>Acacia melanoxylon</i>	✓	<i>Alternanthera denticulata</i>	✓ M

Species Name	Woodland	Wetland	Species Name	Woodland	Wetland	Species Name	Woodland	Wetland
<i>Austrodanthonia racemosa</i>	-	-	<i>Allocasuarina verticillata</i>	-	-	<i>Dactylis glomerata</i>	✓	
<i>Azolla filiculoides</i>	✓		<i>Austrodanthonia ?duttoniana</i>	✓		<i>Delairea odorata</i>	-	
<i>Bursaria spinosa</i>	✓		<i>Austrodanthonia pilosa</i>	✓		<i>Dimorphotheca</i> sp.	-	
<i>Callistemon sieberi</i>	✓		<i>Austrodanthonia setacea</i>	M		<i>Echinochloa crus-galli</i>	-	
<i>Callitriche ?sonderi</i>		M	<i>Bolboschoenus</i> spp.	✓		<i>Echinochloa esculenta</i>		✓
<i>Calystegia ?sepium</i>	-		<i>Callistemon sieberi</i>	✓		<i>Ehrharta erecta</i>	M	
<i>Carex appressa</i>	-	✓	<i>Carex fascicularis</i>	✓		<i>Elytrigia</i> sp.	-	
<i>Centella cordifolia</i>	-		<i>Coprosma quadrifida</i>	✓		<i>Euphorbia pepulus</i>		-
<i>Centipeda ?elatinoidea</i>		M	<i>Crassula helmsii</i>	✓		<i>Ficus carica</i>	✓	
<i>Coprosma quadrifida</i>	D		<i>Dianella longifolia</i> s.l.	✓		<i>Foeniculum vulgare</i>	-	
<i>Dichondra repens</i>	✓		<i>Dianella admixta</i>	-		<i>Fraxinus angustifolia</i>	✓	
<i>Elatine gratioloides</i>		-	<i>Dodonaea viscosa</i>	✓		<i>Fraxinus angustifolia</i>	-	
<i>Eleocharis sphacelata</i>		✓	<i>Eleocharis sphacelata</i>	✓		<i>Fumaria</i> sp.	✓	
<i>Eucalyptus camaldulensis</i>	D		<i>Elymus scaber</i>	M		<i>Galenia pubescens</i>	-	
<i>Euchiton involucratus</i>	-		<i>Ficinia nodosa</i>	✓		<i>Galium aparine</i>	M	✓
<i>Geranium</i> sp. 5	-		<i>Goodenia ovata</i>	✓		<i>Geranium molle</i>	-	
<i>Goodenia ovata</i>	-		<i>Gynatrix pulchella</i>	✓		<i>Grevillea robusta</i>	-	
<i>Isolepis cernua</i> var. <i>cernua</i>		-	<i>Hakea nodosa</i>	-		<i>Hedera helix</i>	✓	
<i>Juncus amabilis</i>	✓	M	<i>Juncus ingens</i>		✓	<i>Helminthotheca echioides</i>		-
<i>Juncus gregiflorus</i>		✓	<i>Juncus pauciflorus</i>	✓		<i>Hirschfeldia incana</i>	-	
<i>Juncus sarophorus</i>	✓	✓	<i>Juncus subsecundus</i>	✓		<i>Holcus lanatus</i>	-	
<i>Juncus ?subsecundus</i>	-		<i>Kunzea ericoides</i> s.l.	✓		<i>Hypochoeris radicata</i>	-	
<i>Lachnagrostis filiformis</i>		-	<i>Lemna disperma</i>	✓		<i>Leontodon taraxacoides</i>	-	
<i>Lemna disperma</i>		D	<i>Leptospermum scoparium</i>	✓		<i>Lepidium africanum</i>		
<i>Lepidium pseudohyssopifolium</i>	✓		<i>Lomandra longifolia</i>	✓		<i>Lepidium didymum</i>	-	
<i>Leptospermum obovatum</i>	✓		<i>Lythrum salicaria</i>	-		<i>Ligustrum lucidum</i>	-	
<i>Lycopus australis</i>		✓	<i>Melaleuca ericifolia</i>	✓		<i>Lonicera japonica</i>	✓	
<i>Melaleuca ericifolia</i>	M		<i>Melicytus dentatus</i> s.l.	✓		<i>Lotus subbiflorus</i>	-	
<i>Melicytus dentatus</i> s.l.	D		<i>Microlaena stipoides</i>	D		<i>Malva nicaeensis</i>	-	
<i>Microlaena stipoides</i>	✓		<i>Myoporum</i> sp. 1	✓		<i>Malva parviflora</i>	-	
<i>Muellerina eucalyptoides</i>	-		<i>Olearia lirata</i>	✓		<i>Medicago polymorpha</i>	-	-
<i>Oxalis exilis/perennans</i>	-		<i>Poa ensiformis</i>	✓		<i>Mentha ?pulegium</i>	-	
<i>Persicaria decipiens</i>	✓	M	<i>Pomaderris aspera</i>	✓		<i>Modiola caroliniana</i>	✓	
<i>Persicaria hydropiper</i>		M	<i>Prostanthera lasianthos</i>	✓		<i>Nymphaea</i> sp.		✓
<i>Persicaria lapathifolia</i>	M	✓	<i>Schoenoplectus</i>	✓		<i>Oxalis pes-caprae</i>	✓	
<i>Persicaria praetermissa</i>	-	✓	<i>Triglochin procera</i>	✓		<i>Paspalum dilatatum</i>	✓	-
<i>Persicaria prostrata</i>		-				<i>Paspalum distichum</i>		M
<i>Persicaria subsessilis</i>	✓	M	Weed species			<i>Pennisetum clandestinum</i>	✓	
<i>Phragmites australis</i>	-	✓	<i>Acmena smithii</i>	-		<i>Persicaria maculosa</i>		✓
<i>Portulaca oleracea</i>	✓		<i>Allium triquetrum</i>	M		<i>Phalaris aquatica</i>	-	
<i>Pseudognaphalium luteoalbum</i>		-	<i>Anagallis arvensis</i>	✓		<i>Piptatherum miliaceum</i>	✓	
<i>Rapanea howittiana</i>	-		<i>Araujia sericifera</i>	✓		<i>Pittosporum undulatum</i>	-	
<i>Ricciocarpos natans</i>		M	<i>Arctotheca calendula</i>		-	<i>Plantago lanceolata</i>	M	
<i>Rubus parvifolius</i>	✓		<i>Asparagus officinalis</i>		-	<i>Plantago major</i>	-	-
<i>Rumex bidens</i>		✓	<i>Aster subulatus</i>		-	<i>Poa annua</i>	-	
<i>Rumex brownii</i>	-		<i>Atriplex prostrata</i>	✓	✓	<i>Polygonum aviculare</i>		-
<i>Senecio minimus</i>	✓		<i>Brassica fruticulosa</i>	✓		<i>Prunella vulgaris</i>	-	
<i>Solanum laciniatum</i>		-	<i>Bromus catharticus</i>	✓		<i>Prunus cerasifera</i>	-	
<i>Triglochin procera</i>		M	<i>Callitriche stagnalis</i>		✓	<i>Quercus robur</i>	✓	
<i>Urtica incisa</i>		-	<i>Cardamine hirsuta</i>	M		<i>Ranunculus repens</i>	✓	
<i>Wolffia australiana</i>		M	<i>Carduus</i> sp.	-		<i>Raphanus raphanistrum</i>	-	-
Planted indigenous species			<i>Chenopodium album</i>		-	<i>Rhamnus alaternus</i>	-	
<i>Acacia acinacea</i>	-		<i>Cirsium vulgare</i>	-		<i>Rorippa palustris</i>	✓	M
<i>Acacia implexa</i>	✓		<i>Conyza sumatrensis</i>	-	✓	<i>Rubus anglocandicans</i>	M	
<i>Acacia mearnsii</i>	✓		<i>Coprosma repens</i>	-		<i>Rumex conglomeratus</i>	-	✓
<i>Acacia melanoxylon</i>	✓		<i>Cotoneaster pannosus</i>		-	<i>Rumex crispus</i>	-	
<i>Acacia pycnantha</i>	-		<i>Crataegus monogyna</i>	✓		<i>Salix babylonica</i> s.l.	-	
<i>Acacia verticillata</i>	-		<i>Cynodon dactylon</i>	✓		<i>Salix cinerea</i>		✓
<i>Alisma plantago-aquatica</i>	M		<i>Cyperus eragrostis</i>	✓	✓	<i>Salix ?fragilis</i>	✓	

Species Name	Woodland	Wetland	Species Name	Woodland	Wetland	Species Name	Woodland	Wetland
<i>Salix matsudana</i> 'Tortuosa'	-		<i>Sonchus asper</i> s.l.	-		<i>Trifolium repens</i>	✓	-
<i>Solanum americanum</i>	M	M	<i>Sonchus oleraceus</i>	✓	✓	<i>Ulmus</i> sp.	-	
<i>Solanum mauritianum</i>	-		<i>Stellaria media</i>	✓		<i>Verbena ?bonariensis</i>	✓	
<i>Solanum nigrum</i>	M	M	<i>Taraxacum</i> sp.	✓		<i>Verbena incompta</i>	✓	
<i>Solanum pseudocapsicum</i>	M		<i>Tradescantia fluminensis</i>	D	-			

Large old trees

Twenty River Red Gums (*Eucalyptus camaldulensis*) were found to qualify as large old trees according to the Department of Sustainability & Environment's criterion for Floodplain Riparian Woodland (i.e. trunk diameters of at least 0.8 m). These are each circled in yellow on the aerial photograph on p. 119. Some could not be measured for safety reasons. The largest trunk diameter measurement was 1.23 m. The trees' health ratings were as follows:

Health Rating:	Very Good	Good	Fair to Good	Fair	Poor
Number of trees:	2	14	2	1	1

Fauna of special significance

The significant fauna species in the list below have been observed at Willsmere Park. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

The species with the highest conservation status is the Grey-headed Flying-fox, because it is listed as vulnerable under the federal *Environment Protection and Biodiversity Conservation Act*. During spotlighting, the author saw one individual suspended in a River Red Gum over the billabong and many hundreds flying overhead, dispersing from their roost site in nearby Yarra Bend Park. This sighting is not significant because such observations can be made across most of Melbourne's eastern suburbs, particularly the more inner suburbs. The most significant species in the list are the Nankeen Night Heron (one of which was seen in this study, and which has a sizeable colony based at nearby Kew Golf Club) and the Azure Kingfisher, which is seen at or near the billabong every year or two.

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
Vulnerable	Rare	Secure	Grey-headed Flying-fox	2004
Endangered	Vulnerable	Extinct	Little Bittern	1950
Vulnerable	Rare	Occasional Visitor	Hardhead	2003
Vulnerable	Secure	Occasional Visitor	Great Egret	1990
Near Threatened	Vulnerable	Occasional Visitor	Azure Kingfisher	2003
Near Threatened	Secure	Endangered	Nankeen Night Heron	2004
	Endangered	Occasional Visitor	Little Friarbird	1989
	Near Threatened	Occasional Visitor	Rufous Songlark	1999
		Endangered	Victorian Smooth Froglet	1994
		Endangered	Striped Marsh Frog	2005
		Endangered	Southern Brown Tree Frog	2004
		Endangered	Water Rat	2002
		Endangered	Crimson Rosella	2005
		Endangered	Sacred Kingfisher	1989
		Endangered	Spotted Pardalote	2005
		Endangered	Crested Shrike-tit	1989
		Endangered	Dusky Woodswallow	1989
		Endangered	Red-browed Finch	1989
		Vulnerable	Common Long-necked Tortoise	2005
		Vulnerable	Little Pied Cormorant	2005
		Vulnerable	Little Black Cormorant	2005
		Vulnerable	White-faced Heron	1990
		Vulnerable	Brown Goshawk	1989
		Vulnerable	Yellow-tailed Black-Cockatoo	1999
		Vulnerable	Musk Lorikeet	1989
		Vulnerable	Eastern Rosella	2004
		Vulnerable	Tawny Frogmouth	2004

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
		Vulnerable	Laughing Kookaburra	2005
		Vulnerable	Superb Fairy-wren	2005
		Vulnerable	White-browed Scrubwren	2005
		Vulnerable	Eastern Yellow Robin	2004
		Vulnerable	Grey Shrike-thrush	1989
		Vulnerable	Grey Fantail	2001
		Vulnerable	Black-faced Cuckoo-shrike	2000
		Vulnerable	Mistletoebird	1989
		Data Deficient	Chocolate Wattled Bat	2003
		Data Deficient	Little Forest Bat	1989
		Occasional Visitor	Black Wallaby	2003
		Occasional Visitor	Australasian Grebe	1989
		Occasional Visitor	White-necked Heron	1976
		Occasional Visitor	Black-fronted Dotterel	1976
		Occasional Visitor	Gang-gang Cockatoo	2004
		Occasional Visitor	Striated Pardalote	1989

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species and obelisks (†) indicate species for which breeding was confirmed.

Butterflies		Birds (continued)		Birds (continued)	
*Cabbage White	2005	Little Black Cormorant	2005	Brown Thornbill	2005
Common Brown	2005	White-faced Heron	1990	Red Wattlebird	2005
Common Grass-blue	2005	White-necked Heron	1976	Little Friarbird	1989
		Great Egret	1990	†Bell Miner	2000
Frogs		Nankeen Night Heron	2004	†Noisy Miner	2005
Common Froglet	2004	Little Bittern	1950	†White-plumed Honeyeater	2004
Victorian Smooth Froglet	1994	Australian White Ibis	2000	Eastern Yellow Robin	2004
Striped Marsh Frog	2005	Brown Goshawk	1989	Crested Shrike-tit	1989
Southern Brown Tree Frog	2004	Purple Swamphen	2004	Grey Shrike-thrush	1989
		†Dusky Moorhen	2005	Magpie-lark	2005
Reptiles		Eurasian Coot	2004	Grey Fantail	2001
Common Long-necked Tortoise	2005	Black-fronted Dotterel	1976	Willie Wagtail	2005
Garden Skink	1989	Silver Gull	1976	Black-faced Cuckoo-shrike	2000
		*Rock Dove	1989	Dusky Woodswallow	1989
Mammals		*Spotted Turtle-Dove	2005	Grey Butcherbird	2005
Platypus	2005	Yellow-tailed Black-Cockatoo	1999	Australian Magpie	2005
Common Brushtail Possum	2004	Galah	2001	Pied Currawong	2000
†Common Ringtail Possum	2004	†Sulphur-crested Cockatoo	2005	†Little Raven	2005
Black Wallaby	2003	Gang-Gang Cockatoo	2004	*House Sparrow	1989
Grey-headed Flying-fox	2004	Rainbow Lorikeet	2005	*Eurasian Tree Sparrow	1989
Chocolate Wattled Bat	2003	Musk Lorikeet	1989	Red-browed Finch	1989
Little Forest Bat	1989	Crimson Rosella	2005	*European Greenfinch	1989
Water Rat	2002	Eastern Rosella	2004	*European Goldfinch	1989
		Red-rumped Parrot	2004	Mistletoebird	1989
Birds		Tawny Frogmouth	2004	†Welcome Swallow	2004
Australian Wood Duck	2005	Azure Kingfisher	2003	Rufous Songlark	1999
*Mallard	1997	Laughing Kookaburra	2005	Silvereye	1989
†Pacific Black Duck	2005	Sacred Kingfisher	1989	*Common Blackbird	2005
†Chestnut Teal	2005	Superb Fairy-wren	2005	*Song Thrush	1990
Hardhead	2003	Spotted Pardalote	2005	*Common Starling	2005
Australasian Grebe	1989	Striated Pardalote	1989	*Common Myna	2005
Little Pied Cormorant	2005	White-browed Scrubwren	2005		

Bird census results

One twenty-minute bird census was carried out as part of the bird survey by David Lockwood on 24/10/04. He recorded thirteen native species and three introduced species. The species with the highest counts were Chestnut Teal (11), Rainbow

Lorikeet (6), Superb Fairy-wren (5), Brown Thornbill (4) and Noisy Miner (4).

Fauna habitat

River Red Gums and accompanying dense stands of Tree Violet (*Melicytus dentatus*) fringing the Yarra River and billabong provide a somewhat secluded habitat in some areas for birds such as the Superb Fairy-wren, White-browed Scrubwren and Grey Fantail. All the recorded honeyeater species are largely insectivorous, reflecting the relatively low nectar production of the vegetation (at least in seasons when the eucalypts are not flowering, which includes both this study and that of Carr and Orscheg (1989)).

The billabong was full of water during the six months in which inspections occurred for this study. In this condition, the billabong provides good habitat for Platypus, waterbirds and frogs, as reflected by the species list. A pair of Little Black Cormorants appeared to be resident at the billabong. The billabong's water body also represents excellent habitat for invertebrates, and some native fish may be present (but no effort has been made to check).

The stormwater treatment wetland to the east of the billabong is also useful habitat, despite being only about one year old. At least two frog species have taken up residence there, and two Platypus were photographed there in June 2005.

Corridors

Numerous birds were observed flying across this site, along the Yarra River and its fringing vegetation. Cormorants, in particular, were often seen flying between this site and the adjacent sites upstream and downstream. Species such as the Sacred and Azure Kingfisher and Australian Pelican that have been observed around the billabong almost certainly reached the site by means of the Yarra River corridor.

Site significance ratings

This site is part of the Department of Sustainability & Environment's BioSite number 5063, which extends along the Yarra River from Burke Rd to Chandler Hwy, on both sides of the river. The significance level given in the BioSites database is 'Regional', but this was based on information and criteria from the 1990s that are now obsolete. The following is an assessment against the current BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to this site.

BioSites criterion 1.1.2 attributes **Local** significance to 'Areas of 100 ha or more of contiguous native vegetation in a heavily fragmented landscape', which applies to the corridor of vegetation along the banks of the Yarra River (extending upstream and downstream of this site).

BioSites criterion 1.2.6 attributes **Regional** significance to links of regional-scale ecological corridors, which applies to this site because its vegetation and wetland represent a component of the Yarra River corridor.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), even quite degraded native vegetation belonging to an endangered EVC (including both EVCs on this site) has a conservation significance rating of High. The conservation significance rises to Very High where the habitat score is at least 40% within an area of an endangered EVC, and both habitat scores determined for this site were well in excess of this (55% and 74%).

According to BioSites criterion 3.2.3, **State** significance applies to any site with a 'remnant patch' whose conservation significance is High or Very High due to the presence of a threatened EVC. This applies to the present site, noting that the size and native understorey cover easily meets any reasonable definition of a remnant patch.

Rare or threatened plants

The site has a small population (approximately six plants) of *Lepidium pseudohyssopifolium*, which is listed by Department of Sustainability & Environment (2005a) as suspected (but not confirmed) to be rare or threatened. BioSites criterion 3.1.2 attributes **Regional** significance to such a site, taking into account that the species is not endemic to Victoria.

The site also supports twenty-eight other species of plants that are threatened in Boroondara, varying from very scarce to abundant. Each one of the species with viable populations gives the site **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

A single individual of the nationally vulnerable Grey-Headed Flying-fox was observed during this study using the site's habitat. Such observations can be made nightly in suburban backyards, so the observation at Willsmere Park cannot be regarded as significant.

The Nankeen Night Heron is listed as vulnerable in Victoria. One was observed at the Willsmere Park, probably belonging to the large colony that is resident a short distance away at Kew Golf Club. The site provides good habitat for this species, thereby qualifying for **Regional** significance under BioSites criterion 3.1.2.

The Great Egret is listed as vulnerable in Victoria, but the one-off sighting of an individual at Willsmere Billabong fifteen years ago is not of much significance.

There are twenty-eight other fauna species recorded from the site that are threatened in Boroondara, one of which (the Azure Kingfisher) is listed as 'near threatened' throughout Victoria. Some of these species (e.g. the White-browed Scrubwren) have viable populations. Any locally threatened species that has a viable population gives the site **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
<p>Environmental weeds. The species of concern are:</p> <ul style="list-style-type: none"> • Serious: Panic Veldt-grass (<i>Ehrharta erecta</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Madeira Winter-cherry (<i>Solanum pseudocapsicum</i>), Wandering Jew (<i>Tradescantia fluminensis</i>); • Moderately serious: White Bladder-flower (<i>Araujia sericifera</i>), Hastate Orache (<i>Atriplex prostrata</i>), Twiggy Turnip (<i>Brassica fruticulosa</i>), Prairie Grass (<i>Bromus catharticus</i>), Hairy Wood-cress (<i>Cardamine ?hirsuta</i> s.l.), Spear Thistle (<i>Cirsium vulgare</i>), Mirror-bush (<i>Coprosma repens</i>), Hawthorn (<i>Crataegus monogyna</i>), Couch (<i>Cynodon dactylon</i>), Drain Flat-sedge (<i>Cyperus eragrostis</i>), Cocksfoot (<i>Dactylis glomerata</i>), Fennel (<i>Foeniculum vulgare</i>), Desert Ash (<i>Fraxinus angustifolia</i>), unidentified fumitory (<i>Fumaria</i> sp.), Cleavers (<i>Galium aparine</i>), Ivy (<i>Hedera helix</i>), Cat's Ear (<i>Hypochoeris radicata</i>), Carolina Mallow (<i>Modiola caroliniana</i>), Paspalum (<i>Paspalum dilatatum</i>), Toowoomba Canary-grass (<i>Phalaris aquatica</i>), Rice Millet (<i>Piptatherum miliaceum</i>), Ribwort (<i>Plantago lanceolata</i>), Greater Plantain (<i>Plantago major</i>), Cherry-plum (<i>Prunus cerasifera</i>), Creeping Buttercup (<i>Ranunculus repens</i>), Yellow Marsh-cress (<i>Rorippa palustris</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Clustered Dock (<i>Rumex conglomeratus</i>), Willows (<i>Salix</i> spp.), Glossy Nightshade (<i>Solanum americanum</i>), Black Nightshade (<i>Solanum nigrum</i>), Chickweed (<i>Stellaria media</i>), White Clover (<i>Trifolium repens</i>), Verbena (<i>Verbena</i> spp.). 	All	Moderate	Current
Carp in the billabong, eating native fauna and creating turbidity.	Wetland fauna	Moderate	Current
Occupation of tree hollows by pests such as feral bees and Common Mynas.	Hollow-dependent native fauna	Moderate	Current
Soil erosion of the banks of the Yarra River during flood.	Floodplain Riparian Woodland; <i>Callistemon sieberi</i>	Moderate	Any major flood
Disturbance of waterbirds by humans and dogs.	Waterbirds	Low to moderate	Current
Predation by foxes and cats. Remains of birds have been found at neighbouring sites.	Fauna	Low to moderate	Current

Threat	Natural assets affected	Severity	When?
Recreational activities: Trampling of vegetation and erosion of the banks of the river and billabong by humans and their dogs.	Floodplain Riparian Woodland; significant plant species	Low to moderate	Current
Disturbance to significant fauna and possible removal of vegetation by the construction and use of a bridge over the Yarra River and associated path, as proposed by Parks Victoria.	Significant fauna; Floodplain Riparian Woodland	Undetermined	Potential
Populations of the aggressive Bell Miner and Noisy Miner may get out of ecological balance, as observed at other sites along the Yarra River.	Floodplain Riparian Woodland; birdlife; large old trees	Moderate	Potential
Grazing and digging by rabbits (which has been identified as a problem in the past).	Floodplain Riparian Woodland; significant plant species	Low to moderate	Potential
Nutrient pollution in soil and water due to ingress of stormwater.	All	Low	Potential
Eucalypt dieback disease due to psyllids, leaf skeletonisers, leaf miners or galls. This threat is currently localised and is likely to occur more generally from time to time.	Floodplain Riparian Woodland; Hollow-bearing trees; Wildlife corridor	Low	Potential
Borer attack of Silver Wattles (<i>Acacia dealbata</i>).	Floodplain Riparian Woodland	Low	Potential

Priority action

The riverbank in the site's southwest has eroded and become very unstable during the record flood of 4th February 2005. A large section of riverbank threatens to collapse into the river, potentially taking the adjacent footpath with it. Engineering advice should be sought about what action is necessary.

Past management and revegetation

It appears that the main management of this site prior to the 1990s was in the north, comprising vegetation clearance and maintenance of mown, open parkland with plantings of Australian native species.

During and since the 1990s, there has been extensive revegetation and weed control in the south, around the billabong and along the riverbank. Since July 2001, such works have been guided by a management plan. Some areas are now less weedy than before, particularly due to removal of woody weeds, but some areas have not improved. Ecological disturbance by floods will always make control of ground-layer weeds such as Cleavers a temporary measure.

The revegetation of the past decade has established well, even in the case of species that would not grow naturally at such a site (e.g. *Myoporum* sp. 1 and *Dodonaea viscosa*).

The billabong has been filled and emptied by pumping at various times. Note that the endangered vegetation type, Floodplain Wetland Complex, fills the billabong when it dries out at a natural rate, and pumping at the wrong times could destroy this community. This is a matter of considerable environmental importance. Recommendation 5.5c of the Willsmere-Chandler Park Management Plan, which is to consider pumping water into Willsmere Billabong, should only be acted on when no harm would come to the endangered vegetation community.

Pollution of the billabong's water and sediment has been ameliorated recently by the construction of the treatment wetland in the site's east, beside the playing fields. The treatment wetland also represents valuable new habitat, due in large measure to the success of the wetland revegetation.

Rabbits have been identified as a problem in this site and control measures have been taken. No evidence of rabbits was observed during this study.

Future revegetation

The recent revegetation should be extended to other areas as resources permit, guided by the 2001 Willsmere – Chandler Park Management Plan. Provision should be made for the labour required to maintain revegetation areas.

Records should be kept of any planting done in this (or any other) site, including species, numbers and locations.

Quadrat Monitoring

Five quadrats (or vegetation study plots) have been studied in this site, as marked on the aerial photograph on page 128. The earliest quadrat (number E03072 in the Victorian Flora Information System) was selected and documented by botanists David Cameron and John Reid in December 1987. The four other quadrats were for the report by Carr & Orscheg (1998), who were apparently unaware of the earlier work. The latter authors gave their quadrats the numbers E04347 to E04350, but the data has never been lodged with the Victorian Flora Information System. Data from their report has been entered into the present project's database. Some obvious errors have been corrected, but the original authors have not provided any resolution of other questionable entries.

The flora data from all five quadrats would provide a useful basis for monitoring of vegetation changes. However, three of the quadrats were deep in water during the present study, leaving only two that would allow new data to be gathered for monitoring (and incidentally, for determination of habitat scores as discussed above).

Quadrat E04348 in 1998 was reassessed in 2005 and the new data given the number N04082. Similarly, the number N04083 has been given to 2005 data gathered from the same area as the original quadrat E04349 in 1998. The 1998 and 2005 data are tabulated side by side in the two tables below. The entries in the columns headed 1998 and 2005 are Braun-Blanquet categories of vegetation cover: '+' = minor occurrence; '1' = <5% cover; '2' = 5-25% cover; '3' = 25-50% cover; '4' = 50-75% cover; '5' = >75% cover.

Southeastern Quadrat – recorded as No. E04348 on 14/5/98 by G.W. Carr and N04082 on 25/2/05 by GS Lorimer
MGA coordinates 327695 m east, 5815765 m north. Quadrat dimensions 35 m × 20 m.

Species Name	1998	2005	Species Name	1998	2005	Species Name	1998	2005
Wild indigenous species			Planted indigenous species			Introduced species (cont.)		
<i>Acacia dealbata</i>	1		<i>Acacia pycnantha</i>		+	<i>Fumaria</i> sp.	1	1
<i>Acacia implexa</i>	1		<i>Acacia verticillata</i>		+	<i>Galium aparine</i>	1	1
<i>Acacia mearnsii</i>	1		<i>Gynatrix pulchella</i>		+	<i>Geranium molle</i>	+	
<i>Acacia melanoxylon</i>	1		<i>Melicytus dentatus</i> s.l.		1	<i>Hedera helix</i>	1	
<i>Acaena novae-zelandiae</i>	1		<i>Myoporum</i> sp. 1		+	<i>Ligustrum lucidum</i>	+	
<i>Alternanthera denticulata</i>		+	<i>Olearia lirata</i>		+	<i>Malva parviflora</i>	+	
<i>Bursaria spinosa</i>	1	1	<i>Pomaderris aspera</i>		1	? <i>Malva</i> sp.		1
<i>Coprosma quadrifida</i>	1	1	Introduced species			<i>Modiola caroliniana</i>	1	
<i>Dichondra repens</i>	1		<i>Acmena smithii</i>	+		<i>Oxalis pes-caprae</i>	1	
<i>Eucalyptus camaldulensis</i>	4	4	<i>Allium triquetrum</i>	1	1	<i>Plantago lanceolata</i>	1	+
<i>Geranium</i> spp.	+	1	<i>Aster subulatus</i>	+		<i>Quercus robur</i>	1	
<i>Goodenia ovata</i>	+	+	<i>Atriplex prostrata</i>	1	+	<i>Raphanus raphanistrum</i>		+
<i>Juncus sarophorus</i>	1		<i>Bromus</i> sp.	1		<i>Rorippa palustris</i>		+
<i>Juncus subsecundus</i>	1		<i>Cardamine hirsuta</i> s.l.		1	<i>Rubus anglocandicans</i>	3	+
<i>Leptospermum obovatum</i>	1	+	<i>Crataegus monogyna</i>	+		<i>Rumex ?conglomeratus</i>		+
<i>Melaleuca ericifolia</i>	2	2	<i>Dactylis glomerata</i>	1		<i>Solanum americanum</i>	1	1
<i>Melicytus dentatus</i> s.l.	1	2	<i>Echinochloa crus-galli</i>		+	<i>Solanum nigrum</i>	1	1
<i>Muellerina eucalyptoides</i>		+	<i>Ehrharta erecta</i>	1	1	<i>Solanum pseudocapsicum</i>	2	1
<i>Oxalis exilis/perennans</i>	+	+	<i>Ficus carica</i>	1		<i>Sonchus oleraceus</i>	1	+
<i>Rubus parvifolius</i>	1	+	<i>Fraxinus angustifolia</i>	1		<i>Stellaria media</i>	1	1
<i>Rumex brownii</i>	+					<i>Tradescantia fluminensis</i>	4	

In the table above, *Goodenia ovata* and *Leptospermum obovatum* are listed as wild (as by Carr & Orscheg 1998), but the present author suspects that they have been planted, at least the individuals present in 2005.

The important conclusions from comparison of the 1998 and 2005 data are as follows:

- The cover of the dominant indigenous species, *Eucalyptus camaldulensis* and *Melaleuca ericifolia*, has not changed detectably. The fears of Carr & Orscheg (1998) about serious decline of *Melaleuca* have not materialised in this quadrat. *Melicytus dentatus* (= *Hymenanthera dentata*) has come to compete with the *Melaleuca* for dominance of the shrub layer, through both natural progression and planting;
- There has great success in removing the huge coverage of the quadrat by the serious weeds, Wandering Jew (*Tradescantia fluminensis*), Blackberry (*Rubus anglocandicans*) and Madeira Winter-cherry (*Solanum pseudocapsicum*) that was recorded in 2005. This is one of several examples of billabongs along the Yarra River where Wandering Jew was completely killed by floods in early 2005;
- Nine indigenous species have disappeared since 1998 and no new ones have volunteered. The losses include three species of tree wattle, raising the question of whether they succumbed to herbicide from weed control work.

Central Quadrat – recorded as No. E04349 on 14/5/98 by G.W. Carr and N04083 on 25/2/05 by GS Lorimer.

MGA coordinates 327685 m east, 5815850 m north. Quadrat dimensions 74 m × 9.5 m (following the waterline).

This quadrat is the area where the author determined the highest habitat score anywhere in Boroondara.

Species Name	1998	2005	Species Name	1998	2005	Species Name	1998	2005
Wild indigenous species			<i>Microlaena stipoides</i>	1	1	<i>Galium aparine</i>		1
<i>Acacia dealbata</i>	2	2	<i>Oxalis exilis/perennans</i>	+		<i>Grevillea robusta</i>	+	
<i>Acacia mearnsii</i>	1		<i>Rumex brownii</i>		+	<i>Hypochoeris radicata</i>	+	
<i>Alternanthera denticulata</i>		+	<i>Senecio minimus</i>		+	<i>Leontodon taraxacoides</i>	+	
<i>Callistemon sieberi</i>	1		Introduced species			<i>Lonicera japonica</i>	1	+
<i>Carex appressa</i>	+	+	<i>Allium triquetrum</i>	1		<i>Paspalum dilatatum</i>	+	+
<i>Centella cordifolia</i>	+		<i>Asparagus officinalis</i>	+		<i>Pittosporum undulatum</i>		+
<i>Coprosma quadrifida</i>	2	3	<i>Aster subulatus</i>	+	+	<i>Plantago lanceolata</i>	1	
<i>Dianella longifolia</i> s.l.		+	<i>Atriplex prostrata</i>		+	<i>Prunella vulgaris</i>	+	
<i>Dichondra repens</i>		+	<i>Bromus catharticus</i>		+	<i>Rubus anglocandicans</i>	3	1
<i>Eucalyptus camaldulensis</i>	4	3	<i>Carduus</i> sp.	+		<i>Rumex conglomeratus</i>		+
<i>Euchiton involucratu</i>	+		<i>Coprosma repens</i>		+	<i>Solanum americanum</i>	1	+
<i>Goodenia ovata</i>		+	<i>Crataegus monogyna</i>	1	+	<i>Solanum pseudocapsicum</i>	2	1
<i>Juncus amabilis</i>	1	1	<i>Cynodon dactylon</i>	1		<i>Sonchus oleraceus</i>	1	+
<i>Juncus ?gregiflorus</i>		+	<i>Cyperus eragrostis</i>	+		<i>Stellaria media</i>	1	1
<i>Juncus sarophorus</i>	1		<i>Dactylis glomerata</i>	+		<i>Taraxacum</i> sp.		+
<i>Lepidium pseudohyssopifolium</i>		+	<i>Dimorphotheca</i> sp.	+		<i>Tradescantia fluminensis</i>	5	
<i>Melaleuca ericifolia</i>	1	1	<i>Ehrharta erecta</i>	1	1	<i>Verbena incompta</i>	1	
<i>Melicytus dentatus</i> s.l.	3	3	<i>Fraxinus angustifolia</i>	1	+			

In the table above, *Dianella longifolia* s.l., *Goodenia ovata* and *Juncus ?gregiflorus* may have been planted.

The important conclusions from comparison of the 1998 and 2005 data are as follows:

- The cover of *Eucalyptus camaldulensis* may have reduced slightly (although the different cover ratings could be an artifice);
- The three dominant indigenous understorey species have not changed detectably;
- The dense carpet of Wandering Jew in 1998 has totally vanished (as happened in most billabongs on the Yarra floodplain following record floods). The second most serious weed of 1998, Blackberry, has reduced substantially. The third worst weed of 1998, Madeira Winter-cherry, also appears to have reduced, but the extent of reduction is unclear.

Ideally, one or more of the quadrats that were submerged during the present study should be reassessed in a summer when they are dry. However, wetlands are such dynamic environments that one should not expect the species present, or their relative abundances, to be similar from one year to the next. The only purpose would be to check whether any significant plant species have disappeared or can be discovered.

Other monitoring

Dieback

The report by Carr & Orscheg (1998, p. 12) mentions a large population of Bell Miners and links them to the observation that 'the Red Gums are in serious decline with very unhealthy canopies'. They advised that the Bell Miners should be shot or otherwise removed, 'otherwise many Red Gums are likely to die in the next decade'. This situation has changed. Bell Miners are no longer abundant and most of the River Red Gums do not have sparse or unhealthy crowns, even though the advice to this study was that there has been no shooting or other steps to remove birds.

Weeds

The 2001 'Willsmere – Chandler Park Management Plan' provides an assessment of the severity of weed species at that time, which can be compared with the author's weed threat ratings presented beneath the heading 'Threats' above and the similar ratings for Chandler Park (page 149). The management plan's rating '1' corresponds approximately to the ratings 'Very serious', 'serious' and 'Moderately serious' used here. After allowing for the different seasons when the assessments were made, and also for some differences of judgement between the authors, some conclusions can be confidently made (which may apply to either of both of Willsmere Park and Chandler Park):

- Many woody weed species and planted Australian native species were eradicated or significantly reduced in numbers between 2000 and 2005. These include the formerly serious African Boxthorn, Hawthorn, Sweet Briar, Willows and Tree Privet;

- The vine weed, Cape Ivy, has evidently declined but White Bladder-flower (or Cruel Vine) has emerged as serious after being unrecorded in 2000, while Ivy remains as a serious weed;
- With the exception of White Bladder-flower and Cleavers, the weeds that are serious now were also recognised as serious in 2000. The different ratings applied to Cleavers could be due to seasonal variability.

Other

The following items have been gathered to provide a baseline for future monitoring:

- The flora lists for the various parts of the site, as provided beneath the heading 'Full flora list' above. Repeat every four years or so. Check for loss or decline of indigenous species and shifts in abundances of weeds;
- Ratings of weed severity within each part of the site, stored in the database of this study;
- Tree health ratings, as stored in the geographic information system data from this study and summarised above;
- The habitat scores that were determined for each of the two quadrats N04082 and N04083 discussed above. Repeat every two to four years and check for changes in habitat score and the reasons why they have occurred. The original field data sheets from this study are available separately and the associated quadrat data is being offered to the Department of Sustainability & Environment;
- Population sizes of scarce plant species: 15 *Callistemon sieberi* at the riverbank location shown on the aerial photograph on page 128; several *Lepidium pseudohyssopifolium* at the more southerly location mapped on the aerial photograph and two at the more northerly location; 4 *Rumex brownii* on the northwestern corner of quadrat E04349; and 5 *Dianella longifolia* s.l. near the centre of the northwestern edge of quadrat E04349. Check the populations every two to four years, noting that shorter-lived species are likely to disappear from existing locations and appear elsewhere;
- Bird survey, including a twenty-minute bird census. Repeat in spring every two to four years. Check for changes in abundance of birds, the particular species present and the species that are breeding;
- The monitoring photographs displayed below and on page 141, with locations and orientations shown on the aerial photograph on page 128. The photographs were taken on 23rd and 25th February 2005. Original digital images are available separately. Repeat the photographs about every two years. Check tree foliage density, the abundance of weeds and structural changes in the vegetation.

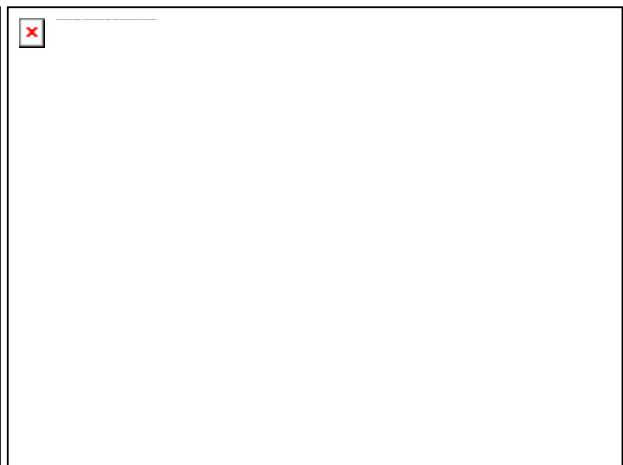
Note that the Friends group could fulfil a valuable role by conducting some of the follow-up monitoring discussed above. Maintaining annual fauna lists (including names of observers and their confidence of identification) would be a useful contribution. They could also monitor populations of significant plants, and would like to be helped to do such tasks.

Monitoring photographs for Willsmere Park, taken on 23rd & 25th February, 2005

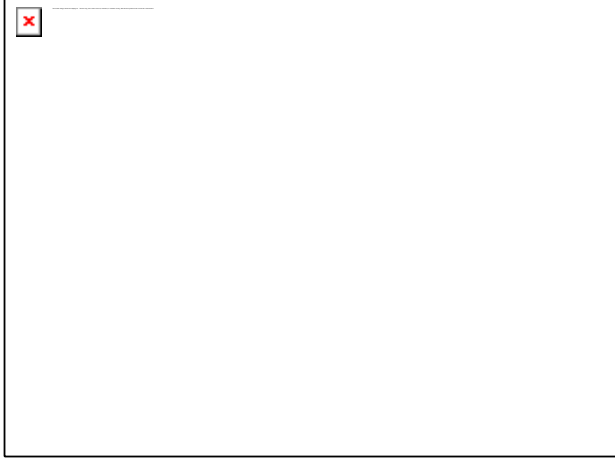
The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 128.



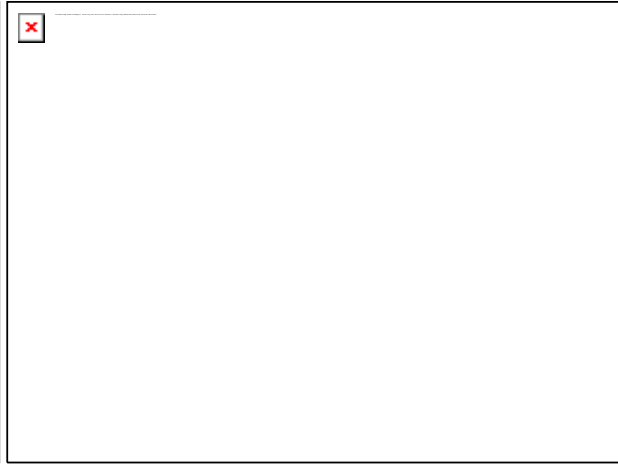
Site 9, Photo 1. A northward view into quadrat E04348 from beside a large River Red Gum. The southern edge of the quadrat runs through the paperwork on the ground. Note the densely shrubby understorey and the very sparse ground flora due to recent flooding.



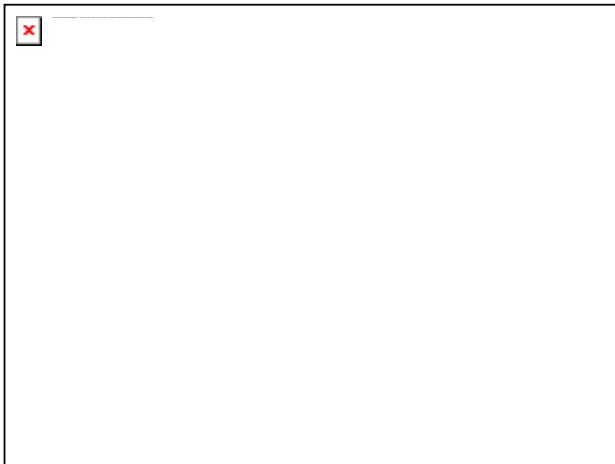
Site 9, Photo 2. A southward view into quadrat E04348 from the midpoint of its northern edge. The low plants in the foreground are the upcoming generation of weeds following flooding.



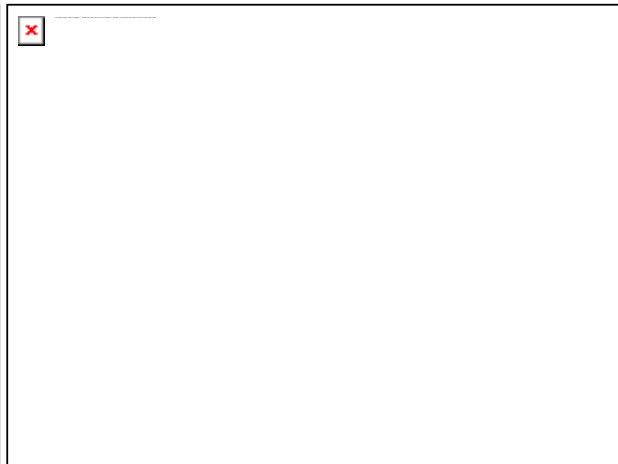
Site 9, Photo 3. Looking northeast along the axis of quadrat E04349, from squatting position to avoid obscuration by the dense shrubs. The shrubs are greyish due to dust from recent flooding.



Site 9, Photo 4. A southwesterly view over the billabong from its eastern bank. The water appears green due to the floating plants, particularly *Lemma disperma*.



Site 9, Photo 5. An eastward view of the new stormwater treatment wetland. Note the thriving, dense plantings of wetland species in the water and native grasses on the banks.



Site 9, Photo 6. A westward view across the northern end of the billabong, seen from the western edge of the adjacent footpath.



Site 9, Photo 7. A view along the axis of the western arm of the billabong from its southwestern end.



Site 9, Photo 8. The parkland setting of the site's north, looking southeastward at a large old River Red Gum whose health was rated as very good. Note the luxuriance of the tree crown and absence of dieback.

Information sources used in this assessment

- A brief site inspection by Dr Lorimer on 6th September 2004 with Council staff, including recording of some breeding birds and aquatic plants;
- A vegetation and habitat survey by Dr Lorimer for a total of ten hours and twenty minutes on 23rd & 25th February 2005, using this study's standard approach described in Section 2.3. This included:
 - Description of the structural and floristic composition of the native vegetation;
 - Compilation of lists of indigenous and introduced plant species in each of six parts of the site, including the species' abundances and the threat level of all weed species in each area;
 - Assessment and documentation of quadrats N04082 and N04083, and associated habitat scores;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Individual measurement and health assessment of large old trees;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- A daytime bird survey of the site by David Lockwood on 24/10/04 according to the protocol discussed in Section 2.4.1, including a twenty-minute bird census;
- Spotlighting sessions for one hour on 12/10/04 and fifty minutes on 25/11/04, including the playing of taped owl calls to attract other owls;
- Carr G.W. and Orscheg C. (1998). '*Flora and Fauna Values and Management Issues, Willsmere Billabong, North Kew*'. Report to EDAW (Aust) Pty Ltd. iii +32 pp. Two species lists and data from four quadrats were used after correction for obvious errors;
- City of Boroondara (2001). '*Willsmere – Chandler Park Management Plan 2001*'. 87 + v pages. Note that there are errors in the species lists in the appendices;
- Fauna data from the NEROC report (Beardsell 1997);
- '*Review of Policies and Controls for the Yarra River Corridor: Punt Road to Burke Road*', a report to the Department of Sustainability & Environment by consultancy firms Planisphere, Jones & Whitehead and Land Design Partnership (June 2005);
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases, including quadrat E03072;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

No documentation found during this study addresses the aquatic fauna of the billabong, which seems the main deficiency in knowledge about the site's natural assets. It is recommended that an aquatic biologist be approached about scoping a study.

A specific effort should be made to seek the Victorian Smooth Froglet. This study's failure to detect it during two spring spotlighting sessions and a dozen hours of daytime work raises concerns about consumption of tadpoles by Carp or other introduced fish in the billabong.

Ideally, the vegetation of one or more of the three quadrats that were submerged during the present study should be reassessed in a summer when they are dry. However, wetlands are such dynamic environments that one should not expect the species that are present, or their relative abundances, to be similar from one year to the next. The only purpose would be to check whether any significant plant species have disappeared or can be discovered.

Once Geoff Carr has prepared an identification key for the *Dianella longifolia* group, the key should be used to refine the identity of the *Dianellas* in this site. Some of the plants may be planted and others may be naturally occurring.

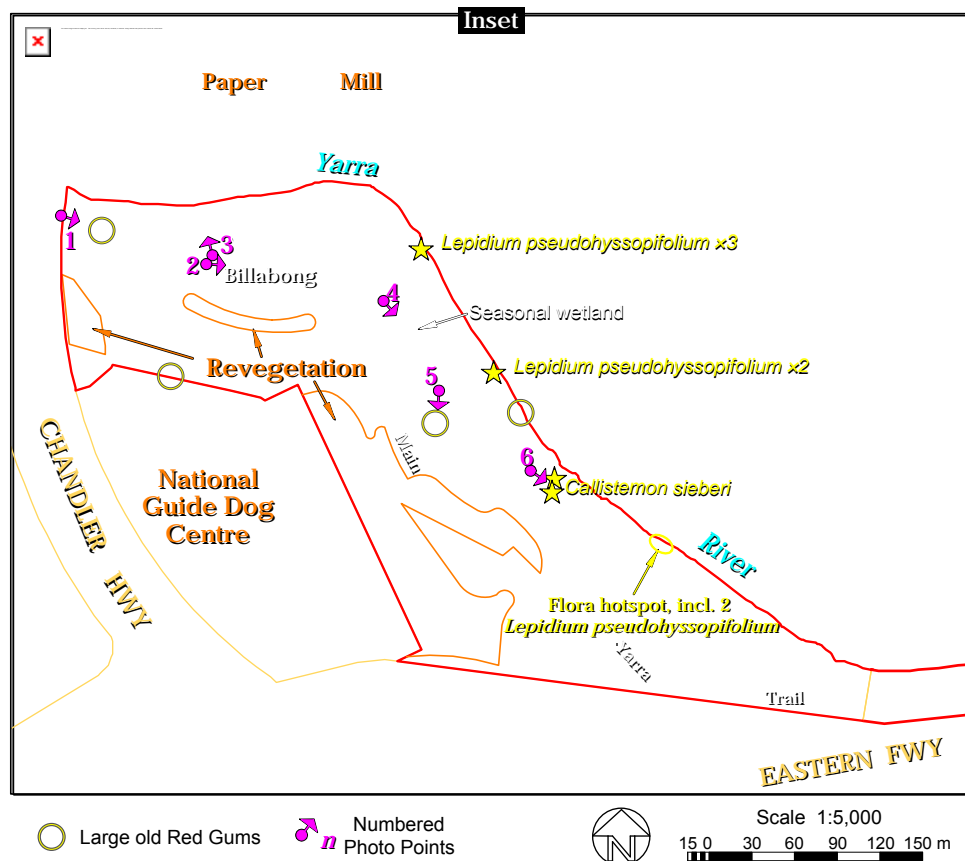
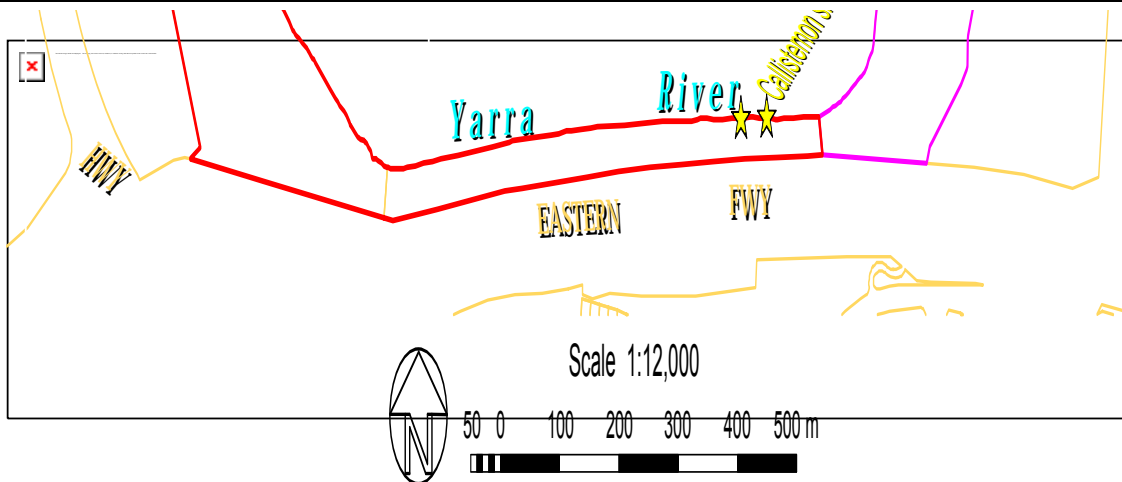
Site 10. Chandler Park, Kew

Public parkland with riverbank, wetlands and revegetation areas. Melway ref. 45 C1.

Site Biological Significance Level: *State*

Summary of significant natural assets:

- The endangered Ecological Vegetation Classes, Floodplain Riparian Woodland and Floodplain Wetland Complex;
- Viable populations of at least six species (five flora and one fauna) that are threatened in Boroondara or Victoria;
- Part of a major ecological corridor along the Yarra River;
- Four large old eucalypts, in poor to good health.



Boundaries

The site is outlined in red on the aerial photograph. It comprises the whole of two properties, namely 2 Chandler Hwy, Kew (the larger, western property abutting the National Guide Dog Centre) and the very elongated oblong allotment (with no title or address) sandwiched between the Eastern Freeway and the adjacent, straight stretch of the Yarra River. The junction between the two properties is shown on the aerial photographs on the previous page as a yellow line.

Land use & tenure: Parkland for recreation, nature conservation, drainage purposes and unpowered transport along the Main Yarra Trail, the responsibility of the City of Boroondara.

Physical features

Site area: 10.6 hectares

Elevation: The normal water level for the Yarra River and billabong is at an elevation of 6 m. The elevation of the floodplain is approximately 10 m. The elevation abutting the freeway and Chandler Hwy is approximately 15 m.

Landform: Floodplain, riverbank, billabong and lower valley slope.

Slope: The floodplain is generally flat, but it slopes down sharply at the river and on the southern and eastern banks of the billabong. Within a distance of typically 20 m of the National Guide Dog Centre, the slope increases to a maximum gradient of 1:9.

Soil type: The sloping land close to the National Guide Dog Centre originally had thin, light grey loam, which has been modified by excavation. The rest of the site has brown to orange-brown, clayey deposits that have been washed down by the river as alluvium, or perhaps partly deposited in the ancient lake that once covered the area from Chandler Highway to Templestowe.

Underlying geology: The bedrock is Silurian sedimentary rock of the Dargile formation, which formed the loam mentioned above. When lava flowed southward through Alphington about 800,000 years ago, it met the Dargile Formation at what is now the Chandler Hwy bridge, forming a natural dam wall and creating a lake extending from this site to Templestowe.

Site description

This site can be divided into three distinct sections:

- The narrow oblong property sandwiched between the Eastern Freeway and the adjacent east-west section of the Yarra River;
- Areas of remnant vegetation on the remainder of the riverbank and around the billabong (marked on the aerial photograph inset above); and
- The remainder of the site, comprising open expanses of grass and mature or semi-mature revegetation plots.

The site's biological significance derives mainly from the second of these sections, where there is reasonable botanical diversity and fauna habitat, belonging to the endangered Ecological Vegetation Class (EVC), Floodplain Riparian Woodland. The vegetation on the riverbank is patchy and some of it contains a high density of large woody weeds, but this is changing as the weeds are being progressively removed and revegetation is carried out. A 15 m - long strip of this section labelled 'flora hotspot' on the inset aerial photograph contains a concentration of significant plants, including two *Lepidium pseudohyssopifolium*, approximately seven *Callistemon sieberi* and four *Lomandra longifolia*.

There appears to have been a moderate amount of historical drainage excavation around the billabong, including the cutting of channels. A greater degree of drainage work has probably been done on the rest of the floodplain within the site. But despite the altered hydrology, the billabong is still an ecologically functional wetland that fills in floods and drains slowly. The billabong contains many indigenous wetland plants (particularly knotweeds (*Persicaria*) and Water-ribbons (*Triglochin procera*)), as shown in photographs on page 151, and these represent the endangered EVC, Floodplain Wetland Complex. The billabong also provides habitat for a range of wetland fauna such as waterbirds, frogs and invertebrates. A depression to the east of the billabong represents a seasonal wetland, providing habitat for native fauna during wetter periods.

The narrow strip of riverbank sandwiched between the Eastern Freeway and the adjacent east-west section of the Yarra River is a man-made landscape produced by re-routing the Yarra River in 1971-2 for the Eastern Freeway. The vegetation is dominated by young River Red Gums (*Eucalyptus camaldulensis*) without the usual accompanying Silver Wattles (*Acacia dealbata*) and Tree Violets (*Melicytus dentatus*). A small number of indigenous plants other than eucalypts have volunteered, notably including two River Bottlebrushes (*Callistemon sieberi*).

The sections of the site with expanses of grass and mature or semi-mature revegetation plots are the least biologically significant parts of the park. However, they still provide habitat for some locally uncommon birds of more open areas, including the only group of Dusky Woodswallows seen in this study.

Ecological links with other land

This site includes part of the almost unbroken corridor of vegetation that extends along the Yarra River upstream from Yarra Bend Park. The river and its vegetated fringe are arguably Melbourne's foremost ecological corridor. Native vegetation and billabongs at Yarra Bend Park and other neighbouring sites on both sides of the Yarra River are critical for the ecological functioning of Chandler Park's flora and fauna.

Habitat types

Water Body (No EVC number). Seasonally, the billabong provides open water habitat for fish, ducks and other aquatic life.

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion)

Approximately 1 ha in the vicinity of the billabong and scattered small patches along the riverbank elsewhere, comprising 29 wild indigenous plant species, 7 planted species and 38 introduced plant species.

Canopy trees: A pure stand of *Eucalyptus camaldulensis*, c. 25 m tall and >1 m trunk diameter at maturity, with crowns overlapping slightly.

Lower trees: *Acacia dealbata* is dense in the more natural areas. The characteristic species, *Melaleuca ericifolia*, is less abundant. The tree weed, *Fraxinus angustifolia*, is rampant.

Shrubs: *Meliccytus dentatus* (= *Hymenanthera dentata*) is locally dense and typically 2-3 m tall. The characteristic riverside species, *Callistemon sieberi*, is represented by approximately seven individuals. *Bursaria spinosa* is very scarce.

Shrubby herbs: There are at least seven plants of *Lepidium pseudohyssopifolium* in three groups, and a single *Senecio hispidulus*.

Vines: The serious weed, *Araujia sericifera*, is abundant. Indigenous vines are limited to one individual of the *Calystegia sepium/silvatica* hybrid complex, and one individual thought to be *Calystegia marginata* (but without flowering or fruiting organs to confirm the identity).

Ferns: None.

Ground flora: Heavily infested by weeds, particularly Couch (*Cynodon dactylon*), Kikuyu (*Pennisetum clandestinum*) and Cleavers (*Galium aparine*). Among the indigenous ground flora are patches of the characteristic species, *Phragmites australis* and *Poa labillardierei*, although the latter may have been planted or descended from planted specimens. There are also plants of *Lomandra longifolia*, *Microlaena stipoides*, *Juncus amabilis* and *Juncus gregiflorus*. Indigenous members of the *Persicaria* genus are abundant on the steep slope of the channel of the Yarra River.

Floodplain Wetland Complex (EVC 172, **regionally Endangered**), incorporating Billabong Wetland

Represented by approximately 0.3 ha in the billabong and a tiny amount in the seasonal wetland to the east (marked on the aerial photograph). Eight indigenous plant species (excluding overhanging branches) and 4 introduced plant species were found during the site investigation for this study, but other species were no doubt present beneath the water.

Woody plants: Confined to some patches of young *Eucalyptus camaldulensis* and overhanging branches from the Floodplain Riparian Woodland.

Dominant species: Dominated at the time of the 2005 survey by *Persicaria decipiens*, also with large numbers of *Alternanthera denticulata*, *Juncus amabilis*, *Lemna disperma* and *Triglochin procera*. Common Duckweed, *Lemna disperma*. *Persicaria subsessilis* and *Phragmites australis* were also present in substantial amounts.

Flora of special significance

The only plant species recorded at the site which the Department of Sustainability & Environment lists as rare or threatened throughout Victoria is *Lepidium pseudohyssopifolium*. This species is listed as data deficient in Victoria, which means that the species is suspected to be rare or threatened but that there is too little information available to be confident. The other conservation status ratings in the table below (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

All the species below were found during the fieldwork for this study.

Conservation Status		Species Name	Notes
Melbourne	Boroondara		
Rare or threatened	Endangered	<i>Lepidium pseudohyssopifolium</i>	7 plants, mapped above
Rare or threatened	Critically Endangered	<i>Calystegia ?marginata</i>	1 plant, not in flower or fruit
Rare or threatened	Vulnerable	<i>Juncus usitatus</i>	Very scarce
Rare or threatened	Data Deficient	<i>Calystegia ?sepium</i>	1 plant, not in flower or fruit
Rare or threatened	Secure	<i>Persicaria subsessilis</i>	Abundant, wetlands and riverbank

Conservation Status		Species Name	Notes
Melbourne	Boroondara		
	Endangered	<i>Carex appressa</i>	Scarce
	Endangered	<i>Lomandra longifolia</i>	4 plants only, at 'flora hotspot'
	Endangered	<i>Callistemon sieberi</i>	c. 11 individuals, some very large
	Vulnerable	<i>Phragmites australis</i>	Abundant
	Vulnerable	<i>Poa labillardierei</i>	Substantial numbers at billabong
	Vulnerable	<i>Acaena novae-zelandiae</i>	Moderate numbers
	Vulnerable	<i>Amyema quandang</i>	Scarce

Full flora list

The following table includes all species of indigenous plants (32 naturally occurring and 7 planted) and weeds (48 species) found at the site during this study. The column headed 'Woodland 1' contains entries for species found in the Floodplain Riparian Woodland of the western property (effectively, the woodland on Inset 1 on page 143); the column headed 'Woodland 2' contains entries for species found in the Floodplain Riparian Woodland beside the straightened stretch of the Yarra River; and the column headed 'Wetlands' contains entries for species found in the billabongs. Within these columns, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Species with underlined names represent an important resource for collection of seed or cuttings.

Species Name	Woodland 1	Woodland 2	Species Name	Woodland 1	Woodland 2	Species Name	Woodland 1	Woodland 2	Wetland
Wild indigenous species			<i>Senecio hispidulus</i>	-		<i>Galenia pubescens</i>	✓		
<i>Acacia dealbata</i>	D	✓	<i>Triglochin procera</i>		M	<i>Galium aparine</i>	✓	✓	
<i>Acaena novae-zelandiae</i>	✓		Planted indigenous species			<i>Geranium dissectum</i>	-		
<i>Alternanthera denticulata</i>	✓	- M	<i>Acacia melanoxylon</i>		✓	<i>Helminthotheca echioides</i>	✓	✓	
<i>Amyema quandang</i>	-		<i>Acacia verticillata</i>			<i>?Iris pseudacorus</i>		✓	
<i>Austroanthonia racemosa</i>	-		<i>Allocasuarina verticillata</i>	-		<i>Ligustrum lucidum</i>	✓		
<i>Bursaria spinosa</i>	-		<i>Eucalyptus ovata</i>		-	<i>Lycium ferocissimum</i>	-		
<u><i>Callistemon sieberi</i></u>	✓	✓	<i>Lomandra longifolia</i>	✓		<i>Modiola caroliniana</i>	M		
<u><i>Calystegia ?marginata</i></u>		-	<i>Myoporum sp. 1</i>	✓		<i>Nassella neesiana</i>	-		
<i>Calystegia ?sepium</i>	-		<i>Pomaderris aspera</i>	✓		<i>Nasturtium officinale</i>		✓	✓
<i>Carex appressa</i>		-				<i>Paspalum dilatatum</i>	✓		
<i>Dichondra repens</i>	✓		Weed species			<i>Paspalum distichum</i>			✓
<i>Eucalyptus camaldulensis</i>	D	D	<i>Acer negundo</i>	✓		<i>Pennisetum clandestinum</i>	D	D	
<i>Juncus amabilis</i>	✓	✓ M	<i>Allium triquetrum</i>	✓		<i>Phalaris aquatica</i>	✓	✓	✓
<u><i>Juncus gregiflorus</i></u>	✓	✓	<i>Anredera cordifolia</i>		✓	<i>Pittosporum undulatum</i>	✓		
<i>Juncus usitatus</i>	-		<i>Araujia sericifera</i>		✓	<i>Plantago lanceolata</i>	✓		
<i>Lemna disperma</i>		M	<i>Asparagus asparagoides</i>		✓	<i>Prunus cerasifera</i>	✓	✓	
<i>Lepidium pseudohyssopifolium</i>	✓		<i>Aster subulatus</i>		✓	<i>Quercus robur</i>	-		
<i>Lomandra longifolia</i>	✓		<i>Atriplex prostrata</i>		✓	<i>Raphanus raphanistrum</i>		✓	
<i>Lunularia cruciata</i>		-	<i>Bromus catharticus</i>		✓	<i>Rubus ?anglocandicans</i>	✓		
<i>Melaleuca ericifolia</i>	✓		<i>Convolvulus ?arvensis</i>		✓	<i>Rumex ?conglomeratus</i>		✓	
<i>Melicytus dentatus s.l.</i>	D	-	<i>Coprosma repens</i>		✓	<i>Salix ?fragilis</i>		✓	
<i>Microlaena stipoides</i>	✓		<i>Crataegus monogyna</i>		✓	<i>Solanum nigrum</i>	✓	✓	
<i>Muellerina eucalyptoides</i>	✓		<i>Cynodon dactylon</i>	D	D	<i>Solanum pseudocapsicum</i>	✓		
<i>Oxalis exilis/perennans</i>	M		<i>Cyperus eragrostis</i>	✓	✓	<i>Sonchus oleraceus</i>		-	
<i>Persicaria decipiens</i>	M	D D	<i>Dactylis glomerata</i>	✓	✓	<i>Taraxacum sp.</i>	✓		
<i>Persicaria lapathifolia</i>	M	M	<i>Ehrharta erecta</i>	✓	✓	<i>Tradescantia fluminensis</i>	✓	✓	
<i>Persicaria subsessilis</i>	✓	✓	<i>Foeniculum vulgare</i>	-		<i>Ulex europaeus</i>	✓		
<i>Phragmites australis</i>	M	✓	<i>Fraxinus angustifolia</i>	✓	✓	<i>Ulmus ?aff. procera</i>		✓	
<i>Poa labillardierei</i>	✓					<i>Verbena ?bonariensis</i>	✓		
<i>Portulaca oleracea</i>	✓								

Four species listed above as planted may actually have at least some individuals that are naturally occurring. They are *Acacia melanoxylon*, *Acacia verticillata*, *Allocasuarina verticillata* and *Eucalyptus ovata*. Conversely, *Poa labillardierei* is listed as wild, but the plants of this species may be all planted or descendants of planted specimens.

Large old trees

Four River Red Gums (*Eucalyptus camaldulensis*) were found to qualify as large old trees according to the Department of Sustainability & Environment's criterion for Floodplain Riparian Woodland (i.e. trunk diameters of at least 0.8 m). These are each circled in yellow on the aerial photograph inset on page 143. One could not be measured for safety reasons. The largest trunk diameter measurement was 1.37 m. The health of the trees was as follows: two good; one fair to good; and one poor. The one in poor health is also the one with the highest habitat value, due to its abundance of hollows (see photograph 5 on page 151).

Fauna of special significance

The significant fauna species in the list below have been observed at Chandler Park. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
Vulnerable	Secure	Occasional Visitor	Great Egret	1989
Near Threatened	Vulnerable	Occasional Visitor	Azure Kingfisher	2003
Near Threatened	Secure	Endangered	Nankeen Night Heron	1989
	Near Threatened	Endangered	Platypus	2000
		Endangered	Victorian Smooth Froglet	1994
		Endangered	Striped Marsh Frog	2005
		Endangered	Southern Brown Tree Frog	1994
		Endangered	Water Rat	1990
		Endangered	Great Cormorant	1989
		Endangered	Crimson Rosella	2005
		Endangered	Sacred Kingfisher	1989
		Endangered	Spotted Pardalote	2005
		Endangered	Crested Shrike-tit	1989
		Endangered	Dusky Woodswallow	2005
		Endangered	Red-browed Finch	1989
		Vulnerable	Little Pied Cormorant	2005
		Vulnerable	Little Black Cormorant	2005
		Vulnerable	White-faced Heron	1989
		Vulnerable	Brown Goshawk	1989
		Vulnerable	Australian Hobby	1988
		Vulnerable	Eastern Rosella	1989
		Vulnerable	Laughing Kookaburra	2005
		Vulnerable	Superb Fairy-wren	1989
		Vulnerable	White-browed Scrubwren	2005
		Vulnerable	Eastern Yellow Robin	1989
		Vulnerable	Grey Shrike-thrush	1989
		Vulnerable	Black-faced Cuckoo-shrike	1989
		Occasional Visitor	Australasian Grebe	1989
		Occasional Visitor	White-necked Heron	1989

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species. Rainbow Lorikeet is the only species for which breeding was confirmed.

Butterflies		Frogs		Mammals	
*Cabbage White	2005	Common Froglet	2005	Platypus	2000
Australian Admiral	2005	Victorian Smooth Froglet	1994	Common Brushtail Possum	2002
		Striped Marsh Frog	2005	Common Ringtail Possum	1988
Reptiles		Southern Brown Tree Frog	1994	Water Rat	1990
Tiger Snake	1989			*Black Rat	1988
				*European Rabbit	1983

Birds

Australian Wood Duck	2005	*Spotted Turtle-Dove	1989	Eastern Yellow Robin	1989
Pacific Black Duck	2005	Galah	1989	Crested Shrike-tit	1989
Chestnut Teal	2005	Sulphur-crested Cockatoo	2005	Grey Shrike-thrush	1989
Australasian Grebe	1989	Rainbow Lorikeet	2005	Restless Flycatcher	1989
Little Pied Cormorant	2005	Crimson Rosella	2005	Magpie-lark	2005
Little Black Cormorant	2005	Eastern Rosella	1989	Willie Wagtail	2005
Great Cormorant	1989	Red-rumped Parrot	2005	Black-faced Cuckoo-shrike	1989
White-faced Heron	1989	Azure Kingfisher	1995	Dusky Woodswallow	2005
White-necked Heron	1989	Laughing Kookaburra	2005	Grey Butcherbird	2005
Great Egret	1989	Sacred Kingfisher	1989	Australian Magpie	1989
Nankeen Night Heron	1989	Superb Fairy-wren	1989	Little Raven	1989
Australian White Ibis	2005	Spotted Pardalote	2005	Red-browed Finch	1989
Brown Goshawk	1989	White-browed Scrubwren	2005	Welcome Swallow	2005
Australian Hobby	1988	Red Wattlebird	1989	*Common Blackbird	2005
Purple Swamphen	1989	Bell Miner	2005	*Song Thrush	1989
Dusky Moorhen	2005	Noisy Miner	2005	*Common Starling	1989
Silver Gull	1989	White-plumed Honeyeater	1989	*Common Myna	1989
*Rock Dove	1989				

Fauna habitat

There are just enough River Red Gums to maintain reasonable continuity of the treed corridor along the Yarra River. A high proportion of the trees are young, but there are nevertheless substantial numbers of hollows among the older trees. The hollows are potential nesting or roosting sites for bats, insects, owls, parrots and possums, as well as for pests such as Common Mynas and feral bees.

The paucity of indigenous shrubs detracts from the site's habitat value for birdlife, but this situation is improving as revegetation matures. For the time being, woody weeds provide some of the cover needed by smaller native birds. As the revegetation matures, the woody weeds can be progressively removed.

The billabong was full of water during this study. In this condition, the billabong provides moderately good habitat for waterbirds and good habitat for frogs and tortoises. Birds were also observed drinking from the billabong. The billabong's water also represents habitat for invertebrates, and some native fish may be present (but no effort has been made to check).

Logs in the billabong improve the habitat value for frogs, fish and tortoises.

Site significance ratings

This site is the westernmost part of the Department of Sustainability & Environment's BioSite number 5063, which extends along the Yarra River from Chandler Hwy to Burke Rd. The significance level given in the BioSites database is 'Regional', but this was based on information and criteria from the 1990s that are now obsolete. The following is an assessment against the current BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to this site.

BioSites criterion 1.1.2 attributes **Local** significance to 'Areas of 100 ha or more of contiguous native vegetation in a heavily fragmented landscape', which applies to the corridor of vegetation along the banks of the Yarra River (extending upstream and downstream of this site).

BioSites criterion 1.2.6 attributes **Regional** significance to links of regional-scale ecological corridors, which applies to this site because its vegetation and wetlands represent a component of the Yarra River corridor.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), any native vegetation belonging to an endangered EVC (including both EVCs on this site) has a conservation significance rating of either High or Very High. According to BioSites criterion 3.2.3, **State** significance applies to any site with a 'remnant patch' whose conservation significance is High or Very High due to the presence of a threatened EVC. This applies to the present site, noting that the size and native understorey cover of native vegetation in and around the billabong can reasonably be regarded as a remnant patch.

Rare or threatened plants

The site has a small population (approximately seven plants) of *Lepidium pseudohyssopifolium*, which is listed by DSE (2005a) as suspected (but not confirmed) to be rare or threatened. BioSites criterion 3.1.2 attributes **Regional** significance to such a site, taking into account that the species is not endemic to Victoria.

The site also supports ten other species of plants that are threatened in Boroondara, varying from scarce to abundant and quite viable. Each one of the species with viable populations gives the site **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

The Great Egret, Azure Kingfisher and Nankeen Night Heron are all on the Department of Sustainability & Environment's list of fauna threatened in Victoria, but the records from Chandler Park are just one-off historical sightings.

Eight other fauna species recorded from the site during this study are threatened in Boroondara, and at least one of them (Striped Marsh Frog) appeared to have a viable, breeding population. Any locally threatened species that has a viable population gives the site **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
<p>Environmental weeds. The species of concern are:</p> <ul style="list-style-type: none"> • Serious: White Bladder-flower (<i>Araujia sericifera</i>), Couch (<i>Cynodon dactylon</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Cleavers (<i>Galium aparine</i>), Water Couch (<i>Paspalum distichum</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Ribwort (<i>Plantago lanceolata</i>), Gorse (<i>Ulex europaeus</i>); • Moderately serious: Box Elder (<i>Acer negundo</i>), Angled Onion (<i>Allium triquetrum</i>), Madeira Vine (<i>Anredera cordifolia</i>), Bridal Creeper (<i>Asparagus asparagoides</i>), Hastate Orache (<i>Atriplex prostrata</i>), Prairie Grass (<i>Bromus catharticus</i>), Common Bindweed (<i>Convolvulus ?arvensis</i>), Mirror-bush (<i>Coprosma repens</i>), Hawthorn (<i>Crataegus monogyna</i>), Drain Flat-sedge (<i>Cyperus eragrostis</i>), Cocksfoot (<i>Dactylis glomerata</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Fennel (<i>Foeniculum vulgare</i>), Galenia (<i>Galenia pubescens</i> var. <i>pubescens</i>), Ox-tongue (<i>Helminthotheca echioides</i>), Yellow Flag (<i>Iris ?pseudacorus</i>), Large-leafed Privet (<i>Ligustrum lucidum</i>), African Box-thorn (<i>Lycium ferocissimum</i>), Carolina Mallow (<i>Modiola caroliniana</i>), Chilean Spear-grass (<i>Nassella neesiana</i>), Watercress (<i>Nasturtium officinale</i>), Paspalum (<i>Paspalum dilatatum</i>), Toowoomba Canary-grass (<i>Phalaris aquatica</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Cherry-plum (<i>Prunus cerasifera</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Clustered Dock (<i>Rumex ?conglomeratus</i>), Crack Willow (<i>Salix ?fragilis</i>), Black Nightshade (<i>Solanum nigrum</i>), Madeira Winter-cherry (<i>Solanum pseudo-capsicum</i>), Dandelion (<i>Taraxacum</i> sp.), Wandering Jew (<i>Tradescantia fluminensis</i>), Purple-top Verbena (<i>Verbena ?bonariensis</i>). 	All	Moderate	Current
Eucalypt dieback disease due to psyllids, leaf skeletonisers, leaf miners or galls. This threat is currently localised and is likely to occur more generally from time to time.	Floodplain Riparian Woodland; Hollow-bearing trees; Wildlife corridor	Moderate	Current

Threat	Natural assets affected	Severity	When?
Populations of the aggressive Bell Miner and Noisy Miner are out of ecological balance, displacing other birds and possibly leading to tree dieback.	Floodplain Riparian Woodland; birdlife; large old trees	Moderate	Current
Disturbance of waterbirds by humans and dogs.	Waterbirds	Low to moderate	Current
Predation by foxes and cats. Remains of birds have been found at neighbouring sites.	Fauna	Low to moderate	Current
Soil erosion of the banks of the Yarra River during flood.	Floodplain Riparian Woodland; <i>Callistemon sieberi</i>	Moderate	Any major flood
Occupation of tree hollows by pests such as feral bees and Common Mynas.	Hollow-dependent native fauna	Moderate	Potential

Priority actions

1. Outbreaks of the serious noxious weed, Gorse (*Ulex europaeus*) should be controlled as a matter of urgency;
2. There should be a program to progressively remove other woody weeds and revegetate with indigenous species;
3. Revegetation close to the bend in the river opposite the paper mill lost all its mulch in the flood of February 2005. Either the mulch should be replaced or additional effort will be required to control weeds in this area.

Past management and revegetation

There has been extensive revegetation at various times during and since the 1990s. Since July 2001, such works have been guided by a management plan. The more mature revegetation plots are marked on the aerial photograph inset on page 143. There has also been revegetation along some of the brow of the riverbank and in a patch beneath the canopy of remnant River Red Gums near the bend in the river opposite the paper mill.

There has been quite limited revegetation along the straightened section of the Yarra River in the past decade.

Future revegetation

Consistent with the 2001 management plan, the recommended focuses of revegetation for the foreseeable future are to:

- Plant more *Acacia dealbata* and *Melicytus dentatus* (= *Hymenanthera dentata*) beside the straightened stretch of the Yarra River (to provide better continuity of the Yarra wildlife corridor for birds of the shrub layer, such as wrens);
- Increase the vegetation cover and width beside the river to the west of the straightened section of the river; and
- Replace woody weeds such as Gorse and Desert Ash as the weeds are removed.

Monitoring

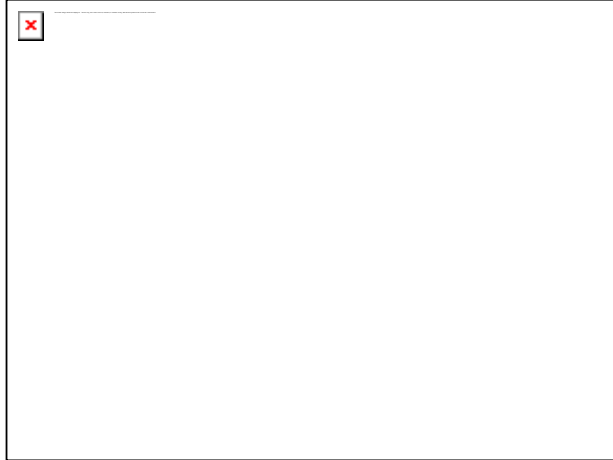
The Willsmere – Chandler Park Management Plan 2001 includes weed threat ratings that provide a useful comparison with the present, as discussed on page 139.

For additional monitoring, the following items have been gathered to provide a baseline:

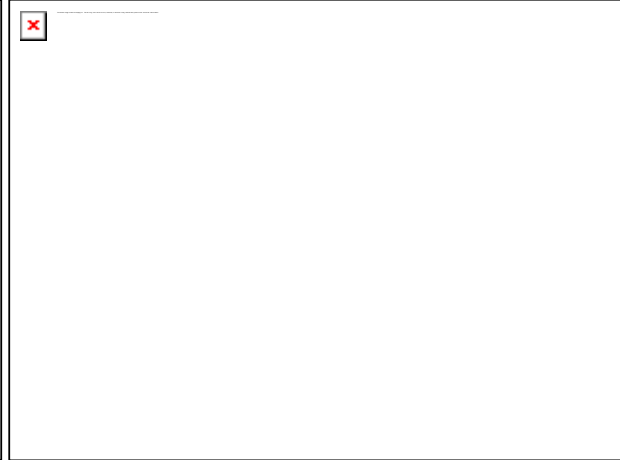
- The monitoring photographs displayed on page 151, with locations and orientations shown on the aerial photograph inset on page 143. The photographs were taken on 21st & 22nd February 2005. Original digital images are available separately. Repeat the photographs about every two years. Check tree foliage density, the abundance of weeds and structural changes in the vegetation.
- Flora lists for four parts of the site, as summarised beneath the heading ‘Full flora list’ above and stored in full detail in this study’s flora database.
- Ratings of weed severity within each of these four parts of the site, stored in the database of this study.
- Tree health ratings, as stored in the geographic information system data from this study and summarised above.
- Population sizes of scarce plant species: *Lepidium pseudohyssopifolium* as marked on the aerial photograph on page 143; and 11 *Callistemon sieberi* (four of them marked individually on the aerial photograph inset and a cluster of seven in the ‘flora hotspot’ on the aerial photograph inset). Check the populations every two to four years, noting that *Lepidium* plants are likely to progressively disappear from existing locations and appear elsewhere.

Monitoring photographs for Chandler Park, taken on 21st & 22nd February, 2005

The locations and orientations of the photographs are shown by numbered arrows on the inset on page 143.



Site 10, Photo 1. An eastward view from close to the Chandler Hwy bridge, to show the condition of the trees (and particularly their crowns).



Site 10, Photo 2. An eastward view across the billabong from its northwestern corner.



Site 10, Photo 3. Looking north along an outlet drain from the billabong, to show the cover of woody weeds (background), low weeds (foreground) and *Persicaria subsessilis* in the water.



Site 10, Photo 4. A southeasterly view over the seasonal wetland, whose character is likely to change greatly from season to season (and probably be weedy for much of the time). Note also the condition of the trees.



Site 10, Photo 5. A particularly old River Red Gum with abundant hollows. Note the condition of the crown.



Site 10, Photo 6. An eastward view of two extremely old *Callistemon sieberi*, with trunk girths to 95 cm.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of five hours and thirty minutes on 21st & 22nd February 2005, using this study's standard approach described in Section 2.3. This included:
 - Description of the structural and floristic composition of the native vegetation;
 - Compilation of lists of indigenous and introduced plant species in each of four parts of the site, including the species' abundances and the threat level of all weed species in each area;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Individual measurement and health assessment of large old trees;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- An internal report by the City of Boroondara in 2001 titled '*Willsmere – Chandler Park Management Plan 2001*'. 87 + v pages;
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

The billabong had more frogs calling than most other billabongs visited by the author at that time of year (late summer). This suggests that a frog call survey is warranted in spring, which is peak breeding season for many frog species.

When the vegetation is next surveyed during a summer when the billabong has dried out, particular attention should be paid to the possibility that *Amphibromus fluitans* may be present, which would represent National significance as the type locality for that species.

Site 11. Yarra Bend Park, Kew

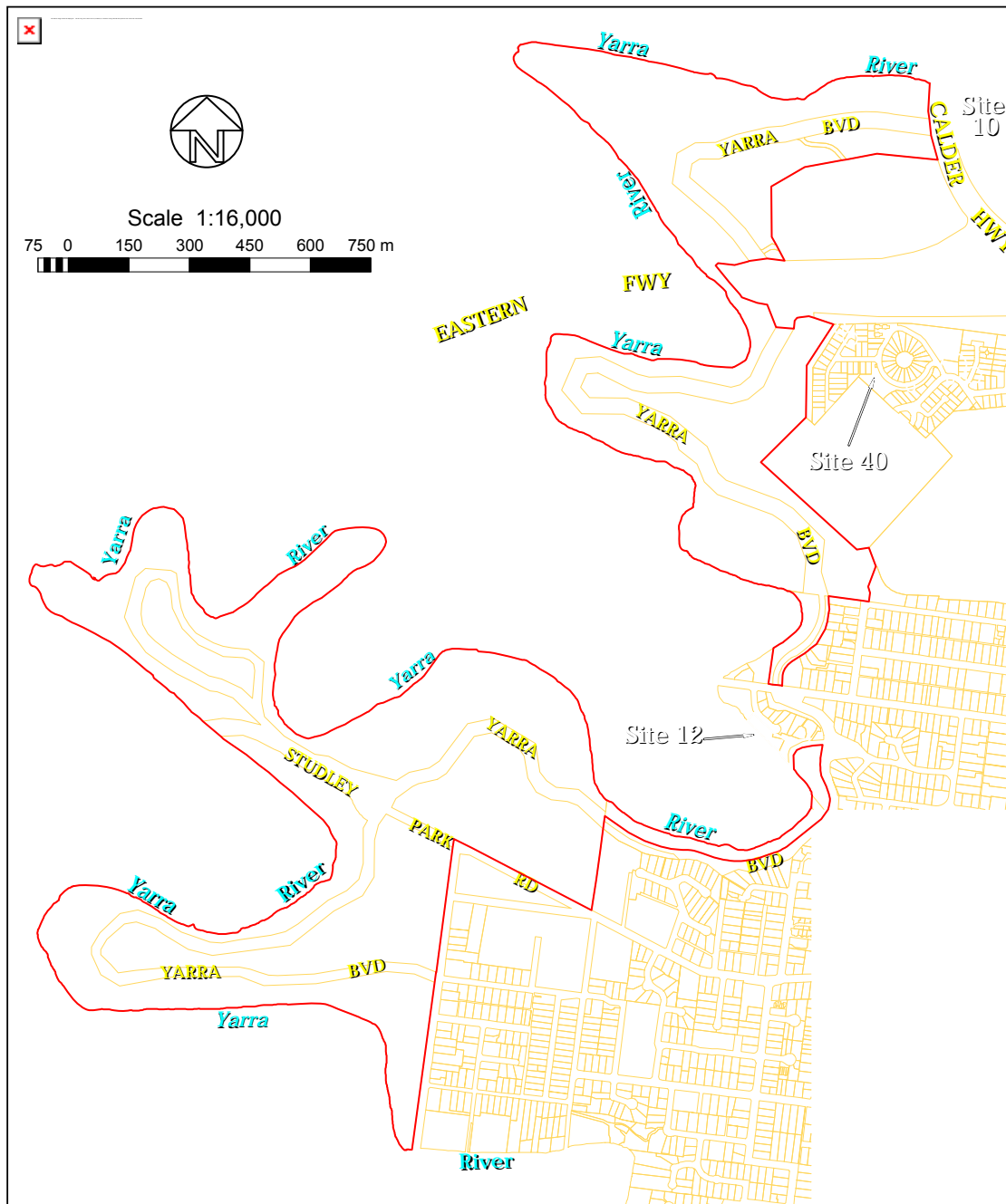
A large public park with bushland and open parkland, managed by Parks Victoria. Melway maps 44 and 45.

Yarra Bend Park was excluded from this study's project brief and is therefore not assessed here in full detail.

Site Significance Level: *National* for rare eucalypts and *State* in several other respects

Summary of the most significant natural assets:

- Nationally significant populations of the rare Studley Park Gum (*Eucalyptus ×studleyensis*) and Melbourne Yellow Gum (*Eucalyptus leucoxydon* subsp. *connata*);
- A particularly rich assemblage of vegetation types, comprising mainly endangered Ecological Vegetation Classes;
- Viable, breeding populations of numerous flora and fauna species that are threatened in Boroondara or state-wide;
- Part of a major ecological corridor along the Yarra River;
- Numerous large old trees.



Boundaries

The site is the whole of Yarra Bend Park, which is taken here to include the section of park that links River Retreat (Site 12) with Studley Park. The boundary is depicted in red on the aerial photograph.

Land use & tenure: Public park managed by Parks Victoria.

Physical features

Site area: 143 hectares

Elevation: 6-60 metres.

Landform: Riverbank, floodplain, riverine escarpment and undulating plain.

Soil types: Alluvium, light grey clay and sands.

Underlying geology: Sandstones and siltstones of the Dargile Formation (which is Silurian), with caps of Red Bluff sands (Tertiary) on the highest ground.

Site description

Yarra Bend Park is Boroondara's premier site for nature conservation, and one of the most important in the Melbourne area. Recognition of its significance goes back at least as far as the 1880s (Reader 1885). The park's nature conservation assets are discussed by Beardsell (1997, 2003), and references cited therein, and only summarised here to the extent necessary to highlight the park's high conservation significance.

Habitat types

Water Body (No EVC number)

Plains Grassy Woodland (EVC 55, **endangered** in the Gippsland Plain bioregion)

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion)

Box Ironbark Forest (EVC 61, **regionally Vulnerable**)

Wetland Formation (EVC 74) – represented in the park only by artificially created wetlands

Grassy Woodland (EVC 175, **endangered** in the Gippsland Plain bioregion)

Riparian Woodland (EVC 641, **endangered** in the Gippsland Plain bioregion)

Escarpment Shrubland (EVC 895, **endangered** in the Gippsland Plain bioregion)

Flora of special significance

This section includes plant species that are rare or threatened in the greater Melbourne area or in Victoria as a whole, *not those that are threatened only at the local scale* (unlike the lists for every other site). This is because the list would otherwise extend for two more pages. Additional information can be obtained from Appendix B, which indicates every indigenous plant species recorded in the park. The conservation status ratings in the table below (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18). The years in the 'last record' column are approximate.

Victoria	Conservation Status		Species Name	Last Record
	Melbourne	Boroondara		
Endangered	Rare or threatened	Critically Endangered	<i>Eucalyptus ×studleyensis</i>	2001
Vulnerable	Rare or threatened	Endangered	<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	2001
Vulnerable	Rare or threatened	Vulnerable	<i>Eucalyptus leucoxyton</i> subsp. <i>connata</i>	2005
Rare	Rare or threatened	Endangered	<i>Geranium</i> sp. 3	2001
Rare	Rare or threatened	Endangered	<i>Nicotiana suaveolens</i>	2001
Data Deficient	Rare or threatened	Critically Endangered	<i>Bolboschoenus fluviatilis</i>	2001
	Critically Endangered	Critically Endangered	<i>Acacia montana</i>	2001
	Vulnerable	Critically Endangered	<i>Dipodium punctatum</i> s.s.	1998
	Rare or threatened	Extinct	<i>Arthropodium minus</i>	1987
	Rare or threatened	Extinct	<i>Cyrtostylis reniformis</i>	1995
	Rare or threatened	Extinct	<i>Hypericum japonicum</i>	1883
	Rare or threatened	Extinct	<i>Muehlenbeckia adpressa</i>	1995
	Rare or threatened	Extinct	<i>Myriophyllum caput-medusae</i>	1884
	Rare or threatened	Extinct	<i>Ozothamnus obcordatus</i>	2001

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
	Rare or threatened	Extinct	<i>Platysace heterophylla</i> var. <i>heterophylla</i>	1987
	Rare or threatened	Extinct	<i>Triptilodiscus pygmaeus</i>	1987
	Rare or threatened	Critically Endangered	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	2001
	Rare or threatened	Critically Endangered	<i>Doodia australis</i>	2001
	Rare or threatened	Critically Endangered	<i>Hypolepis rugosula</i>	2001
	Rare or threatened	Critically Endangered	<i>Austrostipa blackii</i>	1987
	Rare or threatened	Critically Endangered	<i>Austrostipa densiflora</i>	2001
	Rare or threatened	Critically Endangered	<i>Austrostipa nodosa</i>	1977
	Rare or threatened	Critically Endangered	<i>Eragrostis parviflora</i>	2001
	Rare or threatened	Critically Endangered	<i>Panicum effusum</i>	2001
	Rare or threatened	Critically Endangered	<i>Schoenoplectus tabernaemontani</i>	2001
	Rare or threatened	Critically Endangered	<i>Thelymitra rubra</i>	2001
	Rare or threatened	Critically Endangered	<i>Amyema miquelii</i>	2001
	Rare or threatened	Critically Endangered	<i>Brachyscome perpusilla</i>	1987
	Rare or threatened	Critically Endangered	<i>Calandrinia calyptrata</i>	2001
	Rare or threatened	Critically Endangered	<i>Calandrinia eremaea</i>	2001
	Rare or threatened	Critically Endangered	<i>Calystegia marginata</i>	1999
	Rare or threatened	Critically Endangered	<i>Carpobrotus modestus</i>	2001
	Rare or threatened	Critically Endangered	<i>Carpobrotus</i> sp.	1987
	Rare or threatened	Critically Endangered	<i>Chrysocephalum semipapposum</i>	2001
	Rare or threatened	Critically Endangered	<i>Eucalyptus globulus</i> subsp. <i>bicostata</i>	2001
	Rare or threatened	Critically Endangered	<i>Eucalyptus viminalis</i> subsp. <i>pryoriana</i>	2001
	Rare or threatened	Critically Endangered	<i>Galium ?migrans</i>	1995
	Rare or threatened	Critically Endangered	<i>Glycine microphylla</i>	2001
	Rare or threatened	Critically Endangered	<i>Goodenia pinnatifida</i>	1995
	Rare or threatened	Critically Endangered	<i>Hydrocotyle verticillata</i>	2003
	Rare or threatened	Critically Endangered	<i>Leptospermum obovatum</i>	2001
	Rare or threatened	Critically Endangered	<i>Lissanthe strigosa</i> subsp. <i>subulata</i>	2001
	Rare or threatened	Critically Endangered	<i>Lycopus australis</i>	2001
	Rare or threatened	Critically Endangered	<i>Myoporum insulare</i>	2001
	Rare or threatened	Critically Endangered	<i>Pomaderris racemosa</i>	2001
	Rare or threatened	Critically Endangered	<i>Rapanea howittiana</i>	2001
	Rare or threatened	Critically Endangered	<i>Rhagodia candolleana</i>	2001
	Rare or threatened	Critically Endangered	<i>Rumex bidens</i>	2001
	Rare or threatened	Critically Endangered	<i>Sambucus gaudichaudiana</i>	1995
	Rare or threatened	Critically Endangered	<i>Senecio bathurstianus</i>	2001
	Rare or threatened	Critically Endangered	<i>Teucrium corymbosum</i>	2001
	Rare or threatened	Critically Endangered	<i>Vittadinia cuneata</i> var. <i>cuneata</i>	2001
	Rare or threatened	Critically Endangered	<i>Wahlenbergia luteola</i>	2001
	Rare or threatened	Critically Endangered	<i>Wahlenbergia multicaulis</i>	1995
	Rare or threatened	Endangered	<i>Pteris tremula</i>	2002
	Rare or threatened	Endangered	<i>Austrostipa bigeniculata</i>	2001
	Rare or threatened	Endangered	<i>Austrostipa elegantissima</i>	2001
	Rare or threatened	Endangered	<i>Austrostipa rudis</i> subsp. <i>nervosa</i>	2001
	Rare or threatened	Endangered	<i>Austrostipa scabra</i> subsp. <i>scabra</i>	2001
	Rare or threatened	Endangered	<i>Einadia trigonos</i> subsp. <i>trigonos</i>	2001
	Rare or threatened	Endangered	<i>Euchiton sphaericus</i>	2001
	Rare or threatened	Endangered	<i>Myoporum</i> sp. 1	2001
	Rare or threatened	Endangered	<i>Sigesbeckia orientalis</i>	2001
	Rare or threatened	Endangered	<i>Vittadinia cervicalis</i>	2001
	Rare or threatened	Vulnerable	<i>Juncus usitatus</i>	2001
	Rare or threatened	Vulnerable	<i>Disphyma crassifolium</i>	2001
	Rare or threatened	Vulnerable	<i>Elatine gratioloides</i>	1995
	Rare or threatened	Vulnerable	<i>Maireana enchylaenoides</i>	2001
	Rare or threatened	Vulnerable	<i>Persicaria praetermissa</i>	2001
	Rare or threatened	Vulnerable	<i>Persicaria prostrata</i>	2001
	Rare or threatened	Vulnerable	<i>Urtica incisa</i>	2001
	Rare or threatened	Vulnerable	<i>Xerochrysum viscosum</i>	2001

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
	Rare or threatened	Data Deficient	<i>Poa ?rodwayi</i>	2001
	Rare or threatened	Data Deficient	<i>Calystegia ?sepium</i>	2001
	Rare or threatened	Transient	<i>Carex fascicularis</i>	2001
	Rare or threatened	Transient	<i>Tetragonia tetragonioides</i>	2001
	Rare or threatened	Secure	<i>Persicaria subsessilis</i>	2001
	Rare	Vulnerable	<i>Lachnagrostis aemula</i> s.s.	2001

Fauna of special significance

As in the case of flora above, the table below includes fauna species that are rare or threatened in the greater Melbourne area or in Victoria as a whole, *not those that are threatened only at the local scale* (unlike the lists for every other site). Additional information can be obtained from Appendix E, which indicates all vertebrate species recorded in the park. The conservation status ratings in the table below (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status				Species Name	Last Record
National	Victoria	Melbourne	Boroondara		
Endangered	Critically Endangered	Extinct	Extinct	Eastern Barred Bandicoot	1883
Endangered	Critically Endangered	Endangered	Occasional Visitor	Regent Honeyeater	1994
Endangered	Endangered	Near Threatened	Occasional Visitor	Swift Parrot	1989
Endangered	Endangered	Introduced	Introduced	Macquarie Perch	1993
	Critically Endangered	Endangered	Endangered	Australian Mudfish (1 larva)	1991
	Endangered	Vulnerable	Occasional Visitor	Barking Owl	1989
	Endangered	Introduced and rare	Introduced	Freshwater Catfish	2000
	Endangered	Introduced and rare	Introduced	Murray Cod	2000
	Vulnerable	Endangered	Occasional Visitor	Grey Goshawk	1996
	Vulnerable	Vulnerable	Occasional Visitor	Black Falcon	1987
	Vulnerable	Near Threatened	Occasional Visitor	Powerful Owl	1993
	Vulnerable	Secure	Occasional Visitor	Great Egret	2004
	Vulnerable		Introduced	Golden Perch	1993
	Near Threatened	Vulnerable	Occasional Visitor	Azure Kingfisher	2004
	Near Threatened	Near Threatened	Occasional Visitor	Brown Quail	1985
	Near Threatened	Secure	Endangered	Nankeen Night Heron	2004
	Near Threatened	Secure	Occasional Visitor	Pied Cormorant	2001
	Near Threatened		Occasional Visitor	Pacific Gull	1999
		Extinct		Eastern Quoll	1948
		Endangered	Vulnerable	Pouched Lamprey	1994
		Endangered	Occasional Visitor	Peaceful Dove	1990
		Endangered	Occasional Visitor	Cockatiel	2004
		Endangered	Occasional Visitor	Noisy Friarbird	2000
		Endangered	Vagrant	Tawny-crowned Honeyeater	1983
		Endangered	Secure	Spotted Galaxias	1996
		Vulnerable	Vulnerable	Broadfin Galaxias	1995
		Vulnerable	Vulnerable	Flatheaded Gudgeon	1996
		Vulnerable	Vulnerable	Tupong	1996
		Vulnerable	Vulnerable	Crested Pigeon	
		Vulnerable	Vagrant	Yellow-tufted Honeyeater	2002
		Vulnerable	Vagrant	Fuscous Honeyeater	1983
		Vulnerable	Secure	Short-headed Lamprey	1996
		Near Threatened	Critically Endangered	White's Skink	1993
		Near Threatened	Endangered	Platypus	2004
		Near Threatened	Occasional Visitor	Peregrine Falcon	2004
		Near Threatened	Occasional Visitor	Rufous Songlark	1982
		Near Threatened	Occasional Visitor	Bassian Thrush	1993
		Near Threatened	Vagrant	Whistling Kite	1993
		Near Threatened	Vagrant	Swamp Harrier	1985
		Near Threatened	Vagrant	White-winged Triller	1993

Site significance ratings

Most of the parts of Yarra Bend Park that lie in Boroondara are within the Department of Sustainability & Environment's BioSites 3558 or 4862. These BioSites also include the river itself and parts of the park on the opposite side of the Yarra River. The significance level given in the BioSites database is 'state', but this was based on information and criteria from the 1990s that are now obsolete. The following is an assessment against the current BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to this site.

BioSites criterion 1.1.2 attributes **Local** significance to 'Areas of 100 ha or more of contiguous native vegetation in a heavily fragmented landscape', which applies to the park and the corridor of vegetation that extends upstream from the park along the banks of the Yarra River.

BioSites criterion 1.2.6 attributes **Regional** significance to links of regional-scale ecological corridors, which applies to this site because its vegetation and wetlands represent a component of the corridors of the Yarra River and Merri Creek.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), any native vegetation belonging to an endangered EVC has a conservation significance rating of either High or Very High. In Yarra Bend Park, this applies to Plains Grassy Woodland, Floodplain Riparian Woodland, Grassy Woodland, Riparian Woodland and Escarpment Shrubland. The quality of some of the park's representation of the vulnerable EVC, Box Ironbark Forest, is probably also high enough to reach the level of High conservation significance (if not Very High). According to BioSites criterion 3.2.3, **State** significance applies to any site with a 'remnant patch' whose conservation significance is High or Very High due to the presence of a threatened EVC.

Rare or threatened plants

The Melbourne form of Yellow Gum (*Eucalyptus leucoxylon* subsp. *connata*) is vulnerable in Victoria and does not occur naturally interstate. Yarra Bend Park is a stronghold and therefore an important site for conservation of this taxon. This represents **National** significance under BioSites criterion 3.1.2.

The park reportedly has a small population (two old trees in poor health and a dozen saplings) of *Eucalyptus ×studleyensis*, which is a hybrid between the common species *Eucalyptus camaldulensis* and *Eucalyptus ovata*. This hybrid is listed by DSE (2005a) as vulnerable, and it has not been recorded interstate. BioSites criterion 3.1.1 attributes **National** significance to such a site. Studley Park is also the type locality for this taxon (i.e. a specimen from this site is used to scientifically define the taxon), which is of **National** significance under BioSites criterion 5.2.

Yarra Bend Park also supports numerous other species of plants that are rare or threatened in the state, region or municipality, but none of these is endemic to Victoria. Populations of these species are variously of **Regional** or **Local** significance under BioSites criteria 3.1.2, 3.1.4 or 3.1.5, depending on their rarity and the size and viability of their populations.

Rare or threatened fauna

The Great Egret, Azure Kingfisher and Nankeen Night Heron are all on the Department of Sustainability & Environment's list of fauna threatened in Victoria, but the one-off historical sightings are not of much significance.

Eight other fauna species recorded from the site during this study are threatened in Boroondara, and at least one of them (Striped Marsh Frog) appeared to have a viable, breeding population. Any locally threatened species that has a viable population gives the site **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Information sources used in this assessment

- A half-day overview inspection of the park by the author on 16th April 2005;
- The following publications:
 - Beardsell C.M. (1997). 'sites of Faunal and Habitat Significance in North East Melbourne'. Report prepared for NEROC – The North East Regional Organisation of Councils. Published by Nillumbik Shire Council : Greensborough, Vic. 5 volumes (4 of which are only available electronically) + 3 loose maps;
 - Beardsell C.M. (2003). 'The Vegetation of Yarra Bend Park'. Report prepared for Parks Victoria. 75 pp. + 2 maps;
 - References cited in the above reports by Cam Beardsell;

- Reader F.M. (1885). The phanerogamous plants of Studley Park, Kew, near Melbourne. *Victorian Naturalist* **1**: 172-176;
- 'Yarra Bend Park Environmental Action Plan 2002';
- Extensive discussions with Cam Beardsell about the park and particularly the records of significant species;
- Observational records of flora and fauna by Peter Lynch (Team Leader, Environment at Yarra Bend Park) and his staff;
- Discussions with Randall Robinson and identifications staff at the National Herbarium of Victoria regarding records of significant plants from the park;
- Discussion with ornithologist, Fred T.H. Smith, about his records of birds in the park;
- Monthly bird lists from June 1990 to December 1992 from the Bird Observers Club of Australia;
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Acknowledgment

Particular thanks are due to Peter Lynch and Cam Beardsell for their generosity in providing extensive, very high quality information about the park. Thanks also to Fred T.H. Smith and Randall Robinson for clarifying their observations, and to the Bird Observers Club of Australia for their monthly bird lists during 1990-1992.

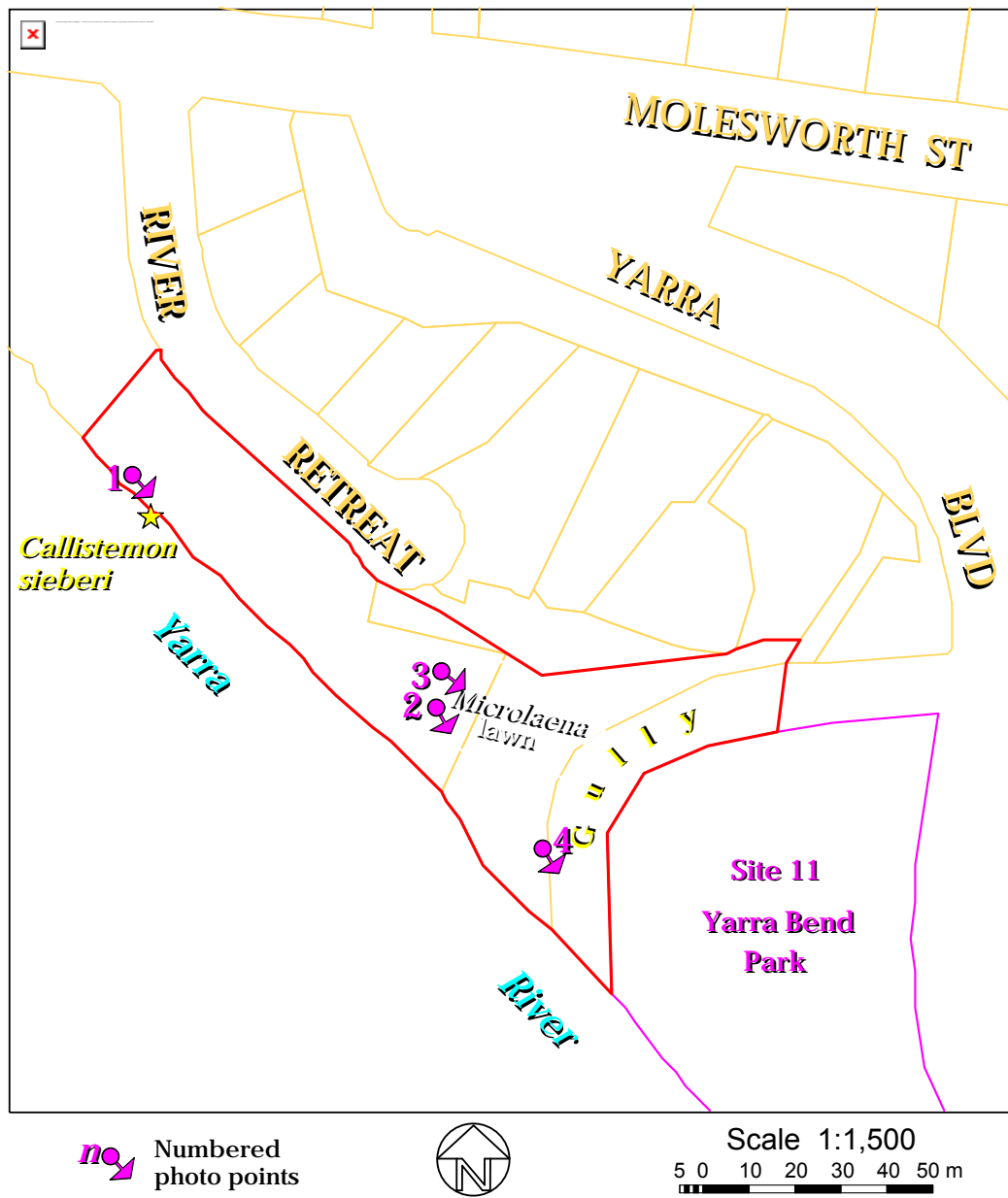
Site 12. River Retreat Reserve, Kew

Council riverbank park and an abutting Melbourne Water drainage reserve along a gully. Melway ref. 44 K4.

Site Biological Significance Level: *State* (when taken in conjunction with contiguous vegetation)

Summary of significant natural assets

- The reserve contains a small area of the endangered Ecological Vegetation Class, Floodplain Riparian Woodland, under restoration;
- There are apparently viable populations of two plant species and one fauna species that are threatened in Boroondara;
- The reserve augments the habitat of the adjoining Yarra Bend Park and is part of a major ecological corridor along the Yarra River.



Boundaries

The site described here is outlined in red on the aerial photograph above. The boundary coincides with property boundaries except for the section where it follows the edge of a driveway extending eastward from the dead end of River Retreat.

Land use & tenure

The allotment along the gully is a Melbourne Water drainage reserve and the rest of the site is a Council amenity park.

Physical features

Site area: 0.53 hectares

Elevation: The normal water level for the Yarra River is at an elevation of 6 m. The highest elevation is 13 m, beside the road.

Landform: Riverbank and intersecting gully.

Slope: The gradient of the riverbank is typically 1:1.8 (very steep) for a width of typically 8m from the normal water level, then changes abruptly to almost flat above there.

Soil type: Sandy alluvium.

Underlying geology: The bedrock is Silurian sedimentary rock of the Dargile formation, but it is buried so deeply that it does not significantly influence the site's biological assets.

Site description

This site comprises a drainage reserve and an amenity park on the bank of the Yarra River. The native vegetation has historically not been given any due care or recognition, and has been mostly cleared for plantings of exotic trees such as Elms and Plane Trees to create a European parkland landscape beside the river. This changed in the past decade, when both the drainage reserve and the Council reserve became managed for conservation as well as amenity, in sympathy with the abutting Yarra Bend Park. (However, maps of Yarra Bend Park do not always recognise the land to the southeast as part of the park). A decade ago, there were probably few remnant indigenous plants other than a small number of remnant River Red Gums and the usual short-lived species that populate the water's edge along the whole of the lower Yarra River. An arborist's report indicates that there were ten large Monterey Cypress trees beside the river in 1998.

In the last few years, the Cypresses and many weeds have been replaced by thriving revegetation plots and very little weed cover. The more mature areas of revegetation are now providing worthwhile habitat for small birds such as scrubwrens and robins. A wetland in the gully (above the footbridge) is providing habitat for frogs, including the locally endangered Southern Brown Tree Frog, as well as improving the quality of water flowing into the Yarra River. A lawn was also been created in 2002 using the native Weeping Grass (*Microlaena stipoides*) in an area that was formerly unsightly (see the aerial photograph). There is potential to improve the amenity of the *Microlaena* lawn by adding a range of wildflower species.

The site's habitat value is steadily improving as the revegetation matures.

Because of the prevalence of revegetation on the site, it is difficult in some cases to be sure whether a particular plant has been planted, is wild or the descendant of planted stock.

Ecological links with other land

This site is part of many kilometres of almost unbroken corridor of native vegetation that extends along the Yarra River. The river and its vegetated fringe are arguably Melbourne's foremost ecological corridor. Native vegetation at Yarra Bend Park and on the opposite side of the Yarra River are critical for the ecological wellbeing of River Retreat Reserve's flora and fauna. The recently released planning policy review for the Yarra River corridor by Planisphere *et al.* (2005) recognises 'strong potential for linking riverside open space through this area'.

Habitat types

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion)

Approximately 0.15 ha on the steeply sloping riverbank and in the lowest 30m of the gully, comprising 13 wild indigenous plant species, 30 planted species and 28 introduced plant species.

Canopy trees: A pure stand of *Eucalyptus camaldulensis*, with crowns overlapping slightly.

Lower trees: *Acacia dealbata* is represented by very few naturally occurring individuals (reduced by historical clearing) but substantial numbers have been planted to restore the natural density.

Shrubs: Wild *Meliccytus dentatus* (= *Hymenanthera dentata*) are fairly abundant in the southern corner. The only other shrubs that are apparently not planted are solitary, young specimens of *Callistemon sieberi* and *Solanum ?laciniatum* at the normal water level of the Yarra River.

Shrubby herbs: *Persicaria lapathifolia* is abundant on the steep riverbank slope since the floods in summer 2004-5.

Vines: None.

Ferns: None.

Ground flora: A sparse scattering of the indigenous species *Alternanthera denticulata*, *Juncus amabilis*, *Juncus usitatus* and *Persicaria decipiens* grows wild at the water's edge and in the gully. There is a higher density of planted indigenous ground flora such as *Poa labillardierei*. Grass weeds and *Tradescantia fluminensis* are also common.

Wetland Formation (EVC 74, **endangered** in the Gippsland Plain bioregion)

0.02 ha in the gully, above the footbridge.

Woody plants: Restricted to overhanging branches.

Herbaceous flora: Dominated by *Typha domingensis*. Other indigenous species include *Juncus amabilis* and *Persicaria decipiens*.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Notes
Melbourne	Boroondara		
Rare or threatened	Vulnerable	<i>Juncus usitatus</i>	Scattered sparsely
	Endangered	<i>Callistemon sieberi</i>	A single, young wild individual (with others planted)
	Endangered	<i>Solanum ?laciniatum</i>	A single, young wild individual (with others planted)
	Vulnerable	<i>Typha domingensis</i>	Dense in the gully

Full flora list

The following table includes all species of indigenous plants (14 naturally occurring and 30 planted) and weeds (28 species) found at the site during this study. Horticultural specimens such as elms and Plane Trees are not listed.

Wild indigenous species	Planted species (cont.)	Weed species	Weed species (cont.)
<i>Acacia dealbata</i>	<i>Allocasuarina littoralis</i>	<i>Agapanthus praecox</i>	<i>Lactuca serriola</i>
<i>Alternanthera denticulata</i>	<i>Callistemon sieberi</i>	<i>Atriplex prostrata</i>	<i>Phalaris aquatica</i>
<i>Callistemon sieberi</i> *	<i>Carex appressa</i>	<i>Brassica ?fruticulosa</i>	<i>Piptatherum miliaceum</i>
<i>Eucalyptus camaldulensis</i>	<i>Cassinia arcuata</i>	<i>Briza maxima</i>	<i>Pittosporum undulatum</i>
<i>Juncus amabilis</i>	<i>Dianella longifolia</i> s.l.	<i>Bromus catharticus</i>	<i>Rubus ?anglocandicans</i>
<i>Juncus usitatus</i>	<i>Dodonaea viscosa</i>	<i>Cirsium vulgare</i>	<i>Rumex ?conglomeratus</i>
<i>Lachnagrostis filiformis</i>	<i>Eucalyptus camaldulensis</i>	<i>Crataegus monogyna</i>	<i>Salix</i> spp.
<i>Melicytus dentatus</i> s.l.	<i>Eucalyptus melliodora</i>	<i>Cyperus eragrostis</i>	<i>Solanum nigrum</i>
<i>Microlaena stipoides</i>	<i>Ficinia nodosa</i>	<i>Echinochloa crus-galli</i>	<i>Solanum pseudocapsicum</i>
<i>Persicaria decipiens</i>	<i>Gynatrix pulchella</i>	<i>Ehrharta erecta</i>	<i>Sonchus asper</i> s.l.
<i>Persicaria lapathifolia</i>	<i>Indigofera australis</i>	<i>Ehrharta longiflora</i>	<i>Sonchus oleraceus</i>
<i>Portulaca oleracea</i>	<i>Kunzea ericoides</i> spp. agg.	<i>Fumaria</i> sp.	<i>Tradescantia fluminensis</i>
<i>Solanum ?laciniatum</i>	<i>Lomandra longifolia</i>	<i>Galium aparine</i>	<i>Tropaeolum majus</i>
<i>Typha domingensis</i>	<i>Melicytus dentatus</i> s.l.	<i>Hedera helix</i>	<i>Verbena ?bonariensis</i>
	<i>Microlaena stipoides</i>		
	<i>Ozothamnus ferrugineus</i>		
	<i>Poa ensiformis</i>		
	<i>Poa labillardierei</i>		
	<i>Pomaderris aspera</i>		
	<i>Rubus parvifolius</i>		
	<i>Solanum aviculare</i>		
	<i>Solanum laciniatum</i>		
Planted species			
<i>Acacia dealbata</i>			
<i>Acacia implexa</i>			
<i>Acacia mearnsii</i>			
<i>Acacia paradoxa</i>			
<i>Acacia pycnantha</i>			
<i>Acacia verticillata</i>			

Fauna of special significance

The significant fauna species in the list below have been observed at River Retreat. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Last Record
Endangered	Southern Brown Tree Frog	2004
Endangered	Spotted Pardalote	2005

* Possibly planted; depicted in Photo 1.

Conservation Status in Boroondara	Species Name	Last Record
Vulnerable	Eastern Rosella	1988
Vulnerable	Laughing Kookaburra	2005
Vulnerable	White-browed Scrubwren	2004
Vulnerable	Eastern Yellow Robin	2004
Vulnerable	Grey Shrike-thrush	2004

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species. The Red-rumped Parrot was the only species for which breeding was confirmed.

Butterflies		Birds		Birds (continued)	
*Cabbage White	2005	Australian Wood Duck	2004	Eastern Yellow Robin	2004
		Dusky Moorhen	2005	Grey Shrike-thrush	2004
Frogs		*Spotted Turtle-Dove	2004	Magpie-lark	2005
Southern Brown Tree Frog	2004	Rainbow Lorikeet	2005	Willie Wagtail	2005
		Eastern Rosella	1988	Grey Butcherbird	2004
Reptiles		Red-rumped Parrot	2004	Australian Magpie	2005
*Gippsland Water Dragon	2003	Laughing Kookaburra	2005	Australian Raven	1988
Tiger Snake	1999	Spotted Pardalote	2005	Little Raven	2004
		White-browed Scrubwren	2004	*House Sparrow	1988
Mammals		Brown Thornbill	2004	Welcome Swallow	2005
Common Brushtail Possum	2004	Red Wattlebird	2005	Silvereye	1999
Common Ringtail Possum	2004	Bell Miner	2005	*Common Blackbird	2005
*House Mouse	1988	Noisy Miner	2005	*Common Starling	2004
		White-plumed Honeyeater	2005	*Common Myna	2005

Bird census results

One twenty-minute bird census was carried out as part of the bird survey by David Lockwood on 25/10/04. He recorded fourteen native species and four introduced species. The species with the highest counts were Rainbow Lorikeet (12), Common Myna (6), Red Wattlebird (5) and Red-rumped Parrot (5). This indicates an imbalance of aggressive, urbanised birds (the Common Myna, Red Wattlebird and Rainbow Lorikeet). However, the presence of the ecologically sensitive species, White-browed Scrubwren, Eastern Yellow Robin and Grey Shrike-thrush indicate that the imbalance is not total, and there is reason to hope for restoration of balance as the revegetation matures.

Fauna habitat

The River Red Gums lining the riverbank provide habitat for common bird species such as the White-plumed Honeyeater, Wood Duck and Red-rumped Parrot. The eucalypt nectar provided by the River Red Gums is augmented by the planted Yellow Box trees (*Eucalyptus melliodora*), extending the period of the year when nectar is available. This is likely to help support certain species of birds and insects, even though Yellow Box is not an indigenous species in riverbank vegetation in this area.

The shrubby revegetation areas were observed being used for foraging by the Brown Thornbill and White-browed Scrubwren.

Rainbow Lorikeets were observed eating the seed of the European trees. Exotic Plane Trees near the street have hollows that may be used by wildlife, but probably only by the Common Brushtail Possum. A dead eucalypt (possibly just outside the reserve) has several small hollows and potentially could serve as a nesting site for the Red-rumped Parrot.

Site significance ratings

This site is within the Department of Sustainability & Environment's BioSite number 3558, most of which comprises Yarra Bend Park. The significance level of the BioSite is given in the BioSites database is 'state', but this takes into account many attributes that are not present at River Retreat Reserve, and in any case was based on information and criteria from the 1990s that are now obsolete. The following is an assessment specifically of River Retreat Reserve against the current BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to ‘All parts of riparian systems with riparian vegetation present’, which applies to this site.

BioSites criterion 1.1.2 attributes **Local** significance to ‘Areas of 100 ha or more of contiguous native vegetation in a heavily fragmented landscape’, which applies to the corridor of vegetation along the banks of the Yarra River (extending upstream and downstream of this site).

BioSites criterion 1.2.6 attributes **Regional** significance to links of regional-scale ecological corridors, which applies to this site because its vegetation represents a component of the Yarra River corridor.

Regionally threatened Ecological Vegetation Class

According to the criteria of ‘Victoria’s Native Vegetation Management – A Framework for Action’ (NRE 2002a), any native vegetation belonging to an endangered EVC (including both EVCs on this site) has a conservation significance rating of either High or Very High. According to BioSites criterion 3.2.3, **State** significance applies to any site with a ‘remnant patch’ whose conservation significance is High or Very High due to the presence of a threatened EVC. This applies to the Floodplain Riparian Woodland within River Retreat Reserve, but only when taken in conjunction with the contiguous Floodplain Riparian Woodland downstream, in Yarra Bend Park (otherwise the area would be too small to qualify as a remnant patch).

Rare or threatened plants

The site also supports viable populations of the locally threatened plant species *Typha domingensis* and *Juncus usitatus* (that latter being part of the much larger population distributed for many kilometres along the river). Both of these give the site **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

Breeding calls of the locally endangered Southern Brown Tree Frog were heard in the wetland within the gully. This species is likely to have a viable, breeding population in the site, which amounts to **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of Victoria’s Native Vegetation Framework (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site’s ecological values are presented in a form to suit the Department of Sustainability & Environment’s ‘BioSites’ database.

Threat	Natural assets affected	Severity	When?
Populations of the aggressive Common Myna (and to a lesser degree, Rainbow Lorikeet and Red Wattlebird) are out of ecological balance, displacing other birds and potentially leading to tree dieback in future.	Floodplain Riparian Woodland; birdlife; large old trees	Moderate	Current
Predation by foxes and cats.	Fauna	Moderate	Current
Planting of ecologically damaging species (e.g. Agapanthus, which had been recently planted in February 2005).	Floodplain Riparian Woodland	Low to moderate	Current
Environmental weeds (presently kept under control). The species of concern are all rated as moderately serious threats: Agapanthus (<i>Agapanthus praecox</i> subsp. <i>orientalis</i>), Hastate Orache (<i>Atriplex prostrata</i>), Twiggy Turnip (<i>Brassica ?fruticulosa</i>), Large Quaking-grass (<i>Briza maxima</i>), Prairie Grass (<i>Bromus catharticus</i>), Spear Thistle (<i>Cirsium vulgare</i>), Hawthorn (<i>Crataegus monogyna</i>), Drain Flat-sedge (<i>Cyperus eragrostis</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Fumitory (<i>Fumaria</i> sp.), Cleavers (<i>Galium aparine</i>), Ivy (<i>Hedera helix</i>), Toowoomba Canary-grass (<i>Phalaris aquatica</i>), Rice Millet (<i>Piptatherum miliaceum</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Clustered Dock (<i>Rumex ?conglomeratus</i>), unidentified Willow (<i>Salix</i> sp.), Black Nightshade (<i>Solanum nigrum</i>),	All	Moderate	Potential

Threat	Natural assets affected	Severity	When?
Madeira Winter-cherry (<i>Solanum pseudocapsicum</i>), Wandering Jew (<i>Tradescantia fluminensis</i>), Nasturtium (<i>Tropaeolum majus</i>), Purple-top Verbena (<i>Verbena ?bonariensis</i>).			
Occupation of tree hollows by pests such as feral bees and Common Mynas.	Hollow-dependent native fauna	Moderate	Potential

Priority action

Follow-up control of environmental weeds in the revegetation areas.

Past management and revegetation

There has been extensive weed removal and revegetation in recent years, leaving thriving revegetation plots and very little weed cover. The revegetation includes the *Microlaena* lawn marked on the aerial photograph on page 1. The idea of planting wildflowers within the lawn was considered by Council.

Future revegetation

For amenity purposes, the *Microlaena* lawn could be planted with wildflowers such as *Bossiaea prostrata*, *Cotula australis*, *Cynoglossum suaveolens*, *Desmodium gunnii*, *Dichondra repens*, *Einadia nutans*, *Geranium* species, *Hypericum gramineum*, *Kennedia prostrata*, *Leptorhynchos squamatus*, *Lobelia pedunculata*, *Oxalis exilis/perennans*, *Poranthera microphylla*, *Solenogyne*, *Viola hederacea*, and various species of *Vittadinia* and *Wahlenbergia*. These species will survive mowing that is not too low and conducted during the period from about Christmas to April.

Otherwise, there is adequate revegetation for the time being. In the next few years, there may be a need to put in some additional plants here and there among the existing revegetation where the density of surviving plants is found to be too low.

Monitoring

None of the pre-existing documentation or data examined in this study provides a basis for comparing present conditions with past conditions at this site.

The following items have been gathered to provide a baseline for future monitoring:

- The monitoring photographs displayed on page 165, with locations and orientations shown on the aerial photograph on page 1. The photographs were taken on 21st February 2005. Original digital images are available separately. Repeat the photographs about every two years. Check tree foliage density, the abundance of weeds and structural changes in the vegetation.
- The flora list for the reserve, as provided beneath the heading 'Full flora list' above and stored in full detail in this study's flora database.
- Ratings of weed severity, as listed under the heading 'Threats' above.
- Bird survey, including a two twenty-minute bird census. Repeat in spring every two to four years. Check for changes in abundance of birds, the particular species present and the species that are breeding.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of one and a half hours on 21st February 2005, using this study's standard approach described in Section 2.3. This included:
 - Compilation of a list of indigenous and introduced plant species, including the species' abundances and the threat level of all weed species in each area;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Spotlighting for twenty-five minutes on the night of 8/11/04, including playing of taped owl calls;
- A daytime bird survey by David Lockwood on 25/10/04 according to the protocol discussed in Section 2.4.1, including a twenty-minute bird census;

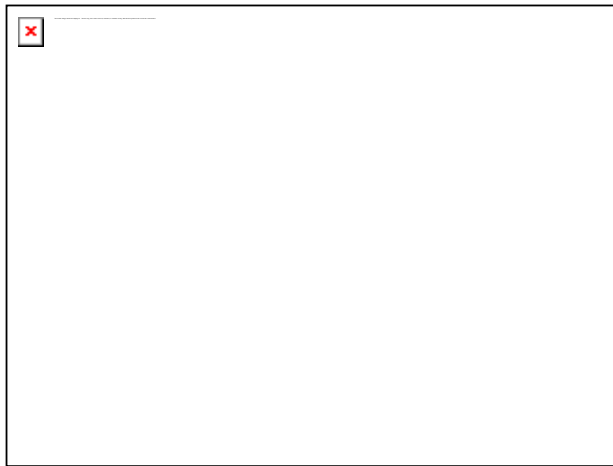
- An arboricultural report by Glenn Waters in 1998 for the City of Boroondara;
- A brief report by Kern L., Gannon P. and Muir A. (2000). '*Flora and Vegetation Mapping on Waterways in the City of Boroondara, Victoria: River Retreat*'. Practical Ecology Pty Ltd, Preston. i + 12 pp;
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

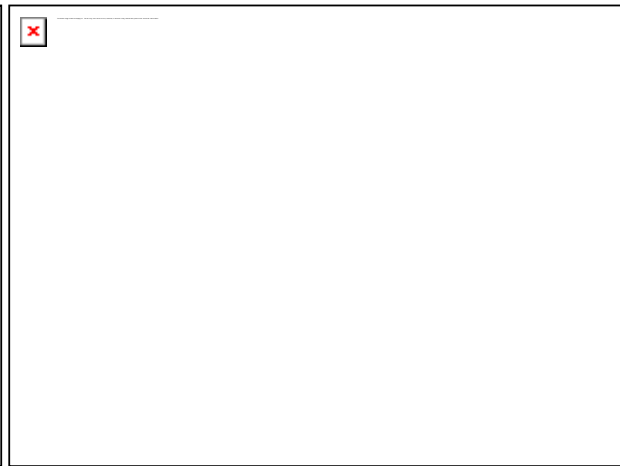
No additional biological investigation is recommended.

Monitoring photographs for River Retreat Reserve, taken on 21st February, 2005

The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 1.



Site 12, Photo 1. Looking downstream from below the most westerly elm in the reserve, to show the state of the riparian revegetation. A small *Callistemon* can be seen overhanging the water.



Site 12, Photo 2. A view of more mature revegetation below the *Microlaena* lawn.



Site 12, Photo 3. Looking southeast across the *Microlaena* lawn.



Site 12, Photo 4. Looking southeast across the outlet of the gully into the Yarra River, with young revegetation and mulch mat.

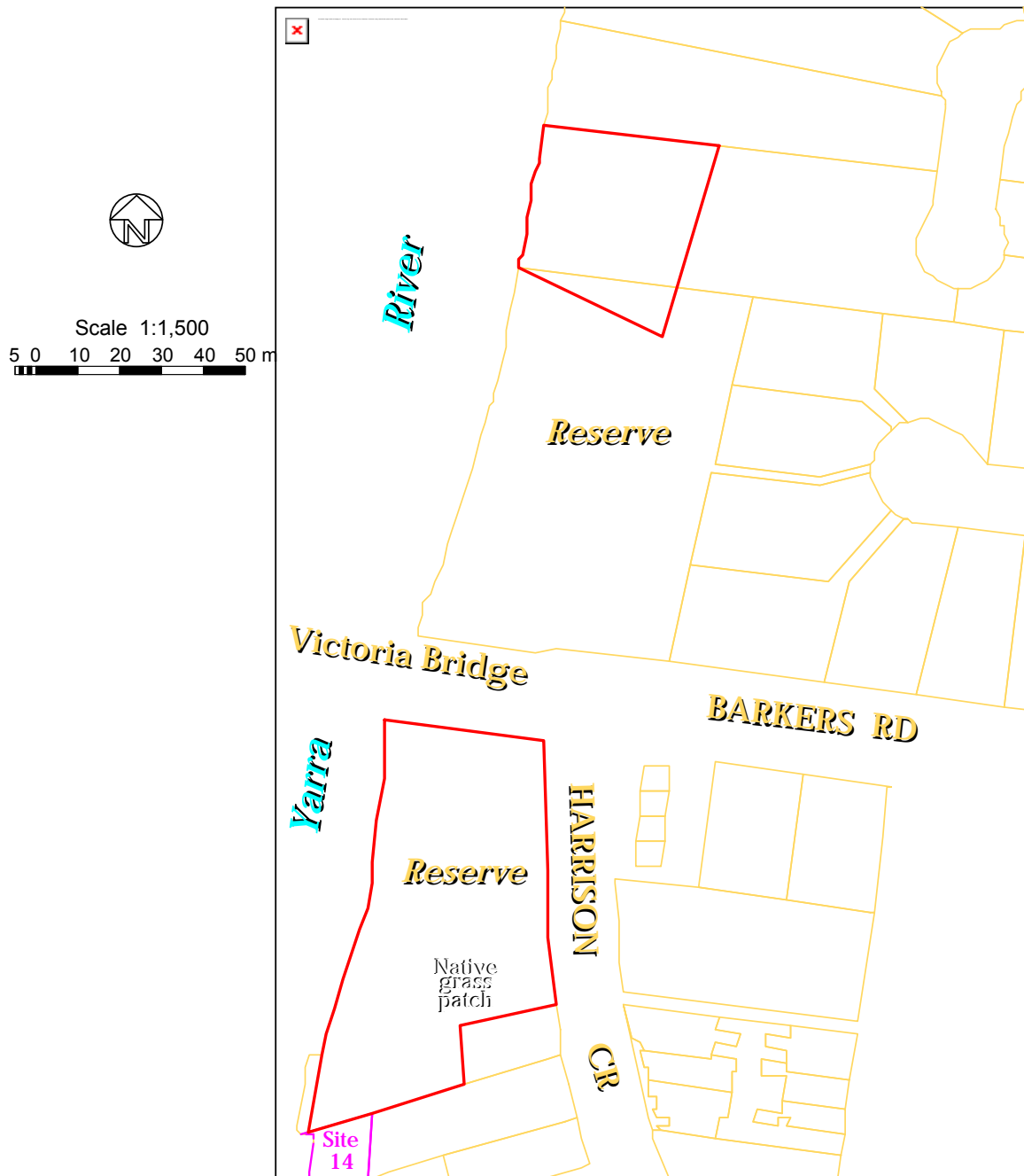
Site 13. Victoria Bridge Escarpment, Kew & Hawthorn

Steep escarpment abutting the Yarra River, comprising public and private land. Melway ref. 44 K7-8.

Site Biological Significance Level: *Local*

Summary of significant natural assets:

- Tiny, degraded areas of two endangered Ecological Vegetation Classes (Riparian Woodland and Escarpment Shrubland);
- At least four locally threatened plant species, including many *Rubus parvifolius*, which is critically endangered in Boroondara;
- Part of a riparian ecological corridor along the Yarra River (ecologically degraded though it is).



Boundaries

This site comprises the two disconnected sections (polygons) outlined in red on the aerial photograph. The southern polygon is the whole of Harrison Crescent Reserve and its boundary is a property boundary. The northern polygon contains a small section of the reserve that extends northward from Victoria Bridge as well as the steeply sloping section of an abutting private allotment (10-12 Blythswood Ct, Kew). The northern and western boundaries of the northern polygon coincide with property boundaries and the eastern boundary is the well-defined top of the escarpment.

Land use & tenure

The southern polygon is a Council reserve with a rowing shed, launching ramp and footpaths. The northern polygon includes a section of Council reserve but is mostly private residential land.

Physical features

Site area: 0.16 hectares in the northern polygon and 0.375 hectares in Harrison Crescent Reserve.

Elevation: The normal water level for the Yarra River and billabong is at an elevation of 1 m. The elevation of the top of the escarpment north of Victoria Bridge reaches a maximum of 34 m in the northeastern corner. Harrison Crescent Reserve has a maximum elevation of 24 m.

Landform: Steep escarpment, tapering slightly at the riverbank.

Slope: The gradient is 1:1 (extremely steep) north of Victoria Bridge and 1:2 (steep) in Harrison Crescent Reserve. Both slopes face west.

Soil type: Mostly dumped light grey loam derived from above the escarpment, mixed with rubble.

Underlying geology: The bedrock is Silurian sedimentary rock of the Dargile formation, which formed the grey loam mentioned above.

Site description

This site's two polygons lie each side of Victoria Bridge, which links Victoria St and Barkers Rd across the Yarra River. The northern section is more biologically significant than the southern section because it contains more locally rare plant species and a much better representation of an endangered Ecological Vegetation Class (namely, Escarpment Shrubland).

Both sections of the site are very steep. They have been previously cleared and subject to extensive earthwork (terracing, pipe laying and dumping of soil). No trees pre-date European settlement. Shrubs, small trees and a few young River Red Gums (*Eucalyptus camaldulensis*, less than 100 years old) have regenerated on the slope, along with abundant weeds. At the foot of the slope, next to the river, River Red Gums and Silver Wattles have regenerated, with even higher weed density than further up the slope.

Despite the history of clearing, excavation and weed invasion, the surviving indigenous plants clearly reflect the pre-European vegetation. The River Red Gums and Silver Wattles beside the river in both of the site's polygons are the natural dominant species of the Riparian Woodland that preceded European settlement. The middle and upper slope of the northern polygon supports characteristic species of the original Escarpment Shrubland community, including *Myoporum* species 1 ('*petiolatum*'), *Acacia implexa*, *Exocarpos cupressiformis* and *Clematis microphylla*. The upper slope of the southern polygon has a patch (labelled 'Native grass patch' on the aerial photograph) with grasses that could reflect either Escarpment Shrubland or Plains Grassy Woodland. All of the vegetation types mentioned above are listed as endangered.

The southern polygon (Harrison Crescent Reserve) has a path diagonally from the northeastern corner that provides access to the rowing shed, launching ramp and southward along the Yarra River to Pridmore Park (Site 14). There is also a minor spur off this path to the 'native grass patch'. Harrison Crescent Reserve includes a substantial number of planted Australian native trees, such as ornamental forms of Yellow Gum (*Eucalyptus leucoxylon*), as well as exotic trees such as olives.

The northern polygon is mostly private land and is very inaccessible. It is therefore quite possible that some plant species went undetected in this study. There are no buildings in the northern polygon.

Ecological links with other land

There is an almost unbroken vegetated corridor extending upstream along the Yarra River to far beyond Boroondara. There is also a narrower and more fragmented vegetation corridor downstream, including the abutting Site 14. Certain bird species, such as cormorants, migrate along the river and its vegetated margins.

Habitat types

Riparian Woodland (EVC 641, **endangered** in the Gippsland Plain bioregion)

Approximately 500 m² in a narrow band beside the Yarra River, divided among both polygons of the site.

Canopy trees: *Eucalyptus camaldulensis*.

Lower trees: *Acacia dealbata* is common, scarcely smaller than the eucalypts.

Vines: *Rubus parvifolius* is present, possibly only as outliers from the Escarpment Shrubland up the slope.

Ground flora: The characteristic species, *Poa labillardierei*, is present among the abundant ground flora weeds.

Escarpment Shrubland (EVC 895, **endangered** in the Gippsland Plain bioregion)

600-700 m² in the northern polygon, comprising 18 indigenous plant species and 24 introduced plant species.

Canopy trees: Sparse *Eucalyptus camaldulensis*, present only north of Victoria Bridge.

Lower trees: *Acacia implexa* is abundant. *Exocarpos cupressiformis* is represented by one suckering individual on the private land. The weed trees, *Pittosporum undulatum* and *Olea europaea* (olive), are abundant (the latter only in Harrison Crescent Reserve).

Shrubs: *Bursaria spinosa* is dense in the most natural patch. The characteristic species, *Myoporum* sp. 1 (*'petiolatum'*), is represented by two individuals on the private land. A solitary *Acacia pycnantha* in the northern polygon could be natural or the descendant of a planted specimen. The declared noxious weeds, *Genista linifolia* and *Genista monspessulana*, are abundant.

Vines: *Rubus parvifolius* is abundant in both polygons and *Clematis microphylla* is fairly common in the northern polygon. The weeds *Delairea odorata* and Blackberry are also common.

Ferns: None.

Ground flora: Heavily infested by weeds, particularly *Aptenia cordifolia*, *Oxalis pes-caprae* and *Tradescantia fluminensis*. The best patch of indigenous ground flora is labelled 'Native grass patch' on the aerial photograph, containing *Austrodanthonia racemosa*, *Austrodanthonia setacea*, *Einadia nutans*, *Lomandra filiformis* subsp. *coriacea*, *Themeda triandra* and *Tricoryne elatior*. The northern polygon also supports *Austrodanthonia fulva* and *Dianella admixta*.

Flora of special significance

The significant plant species below were found during the fieldwork for this study, all of them in the patch north of Victoria Bridge (and all but the *Acacia pycnantha* on private land). The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Notes
Melbourne	Boroondara		
Rare or threatened	Endangered	<i>Myoporum</i> sp. 1 (<i>'petiolatum'</i>)	Two individuals
	Critically Endangered	<i>Exocarpos cupressiformis</i>	One individual with sucker growth
	Critically Endangered	<i>Rubus parvifolius</i>	Fairly numerous
	Vulnerable	<i>Acacia pycnantha</i>	One individual
	Data Deficient	<i>Clematis microphylla</i>	At least three individuals

Full flora list

The following table includes all 18 species of wild indigenous plants and 24 weeds (48 species) found at the site during this study. The column headed 'Woodland' is for species found in the Riparian Woodland, the column headed 'Shrubland S' is for the Escarpment Shrubland in Harrison Crescent Reserve and the column headed 'Shrubland N' is for the Escarpment Shrubland in the northern polygon. Within these columns, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Species with underlined names represent an important resource for collection of seed or cuttings from the public land in this site. Weeds were not recorded in the Riparian Woodland.

Species Name	Woodland	Shrubland S	Shrubland N	Species Name	Woodland	Shrubland S	Shrubland N	Species Name	Woodland	Shrubland S	Shrubland N
Wild indigenous species				Weed species				Weed species (continued)			
<i>Acacia dealbata</i>	D	✓	✓	<i>Anredera cordifolia</i>		-		<i>Hedera helix</i>		✓	
<i>Acacia implexa</i>		✓	D	<i>Aptenia cordifolia</i>			D	<i>Lycium ferocissimum</i>		✓	✓
<i>Acacia pycnantha</i>			-	<i>Avena</i> sp.		-		<i>Olea europaea</i>		D	
<i>Austrodanthonia caespitosa</i>		✓		<i>Brassica fruticulosa</i>		✓	M	<i>Oxalis pes-caprae</i>			D
<i>Austrodanthonia fulva</i>			✓	<i>Crataegus monogyna</i>		✓		<i>Phalaris aquatica</i>		-	
<i>Austrodanthonia racemosa</i>		M		<i>Cynodon dactylon</i>		✓		<i>Piptatherum miliaceum</i>		✓	M
<i>Austrodanthonia setacea</i>		M		<i>Dactylis glomerata</i>		✓		<i>Pittosporum undulatum</i>		✓	D
<i>Bursaria spinosa</i>			D	<i>Delairea odorata</i>		✓	M	<i>Plantago lanceolata</i>		✓	
<i>Clematis microphylla</i>			✓	<i>Ehrharta erecta</i>		✓		<i>Rubus ?anglocandicans</i>		M	
<i>Dianella admixta</i>			✓	<i>Ehrharta longiflora</i>			M	<i>Schinus molle</i>		D	
<i>Einadia nutans</i>		-	M	<i>Genista linifolia</i>			D	<i>Tradescantia fluminensis</i>		✓	D
<i>Eucalyptus camaldulensis</i>	D	✓	D	<i>Genista monspessulana</i>		✓		<i>Vinca major</i>			✓
<i>Exocarpos cupressiformis</i>			-								
<i>Goodenia ovata</i>		-									
<i>Microlaena stipoides</i>		-									
<i>Myoporum</i> sp. 1			-								
<i>Poa labillardierei</i>		-									
<i>Rubus parvifolius</i>	✓	M									
<i>Themeda triandra</i>		-									
<i>Tricoryne elatior</i>		-									

In addition to the wild plant species above, there are various species planted in Harrison Crescent Reserve, including Australian natives and exotics. Some of the weeds, such as *Olea europaea* and *Schinus molle* have apparently spread from planted specimens. There also appears to have been small numbers of indigenous species planted, including *Dodonaea viscosa*, and in one or two cases it is possible that planted specimens have been mistaken as wild and wrongly placed in the list above.

Full fauna list

The following list shows the fauna species (all birds) that were seen at the site during the fieldwork for this study. None of them is significant. Many other species were no doubt not detected due to the brevity of the survey, including all those listed for Site 14.

Australian White Ibis	Brown Thornbill	Noisy Miner	Magpie-lark
Spotted Pardalote	Bell Miner	Eastern Spinebill	

Site significance ratings

The following is an assessment of the site against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to this site.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), any native vegetation belonging to an endangered EVC (including both EVCs on this site) has a conservation significance rating of either High or Very High. The area of native vegetation in the site of interest here is too small to qualify as a 'remnant patch' for the purposes of BioSites criterion 3.2.3, which would otherwise indicate that the site is of state significance.

Rare or threatened plants

At least one locally threatened plant species (*Rubus parvifolius*) has a viable population within the site. Any such species gives the site **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Heart-leaf Ice-plant (<i>Aptenia cordifolia</i>), Couch (<i>Cynodon dactylon</i> var. <i>dactylon</i>), Cape Ivy (<i>Delairea odorata</i>), Flax-leafed Broom (<i>Genista linifolia</i>), Montpellier Broom (<i>Genista monspessulana</i>), Ivy (<i>Hedera helix</i>), Olive (<i>Olea europaea</i>), Soursob (<i>Oxalis pes-caprae</i>), Rice Millet (<i>Piptatherum miliaceum</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Pepper Tree (<i>Schinus molle</i>), Wandering Jew (<i>Tradescantia fluminensis</i>); • Moderately serious: Madeira Vine (<i>Anredera cordifolia</i>), Oat (<i>Avena</i> sp.), Twigg Turnip (<i>Brassica fruticulosa</i>), Hawthorn (<i>Crataegus monogyna</i>), Cocksfoot (<i>Dactylis glomerata</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), African Box-thorn (<i>Lycium ferocissimum</i>), Toowoomba Canary-grass (<i>Phalaris aquatica</i>), Ribwort (<i>Plantago lanceolata</i>), Blue Periwinkle (<i>Vinca major</i>). 	All	High	Current
Continued cutting down of River Red Gum trees (possibly to prevent obstruction of residents' views), as has occurred quite recently.	Escarpment Shrubland	Low	Potential
Eucalypt dieback disease due to psyllids, leaf skeletonisers, leaf miners or galls.	Riparian Woodland; Escarpment Shrubland	Low	Potential

Priority actions

1. Hand-weed in, and adjacent to, the tiny 'native grass patch' labelled on the aerial photograph on page 166 during spring each year. The importance and urgency are moderate on a municipal scale, and the resources required are low.
2. Control woody weeds in Harrison Crescent Reserve, with the focus of work along a diagonal from the native grass patch to the northwest corner. The importance, urgency and resource requirements are moderate on a municipal scale.

Past management and revegetation

The northern polygon has had very little management in recent years, but has been subjected to extensive dumping of rubbish, including garden waste.

Harrison Crescent Reserve was planted many years ago with exotic and Australian native ornamental species, and has had a very small amount of planting of indigenous species in the last few years. Most of the reserve has had little weed control for quite some years, allowing some weeds to become rampant. The lawn near the launching ramp is kept mown.

Future revegetation

If woody weeds are removed as proposed in Priority Action 2 above, replace the weeds with indigenous plants from the following list:

<i>Acacia implexa</i>	<i>Dillwynia cinerascens</i>	<i>Lomandra longifolia</i>
<i>Acacia pycnantha</i>	<i>Exocarpos cupressiformis</i> (if procurable)	<i>Myoporum</i> sp. 1 ('petiolatum')
<i>Clematis microphylla</i>	<i>Goodenia ovata</i>	<i>Olearia ramulosa</i>
<i>Dianella admixta</i>	<i>Hardenbergia violacea</i>	

Records should be kept of any planting done in this (or any other) site, including species, numbers and locations.

Monitoring

The report by Kern *et al.* (2000, see details below) includes quadrat data from June 2000 that is ostensibly gathered from the mid-slope surrounding the 'native grass patch' on the aerial photograph, within an area of 30 m². However, the stated area is clearly greatly understated (as in the case of their other two quadrats) and the inclusion of *Callistemon sieberi* raises questions about the stated location on the mid-slope because that species was only found growing in the river (its normal habitat) in 2005. There also appears to have been a misidentification of *Eucalyptus camaldulensis* as *Eucalyptus leucoxyloides* subsp. *connata*. Until these anomalies are resolved and the exact boundaries of the quadrat can be determined, the quadrat data does not serve as a useful basis for monitoring.

No other pre-existing documentation or data examined in this study provides a basis for comparing present conditions with past conditions at this site.

The following items have been gathered to provide a baseline for future monitoring:

- The flora lists tabulated beneath the heading 'Full flora list' above.
- Ratings of weed severity within each of the site's two polygons, stored in the database of this study.
- Population sizes of scarce plant species: One *Acacia pycnantha* on public land in the southeast corner of the northern polygon; one each of *Einadia nutans*, *Themeda triandra* and *Tricoryne elatior* in the 'native grass patch'; one *Exocarpos cupressiformis* with sucker growth on the private land; two *Myoporum* sp. 1 on the private land. Check the populations every two to four years.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of approximately 1½ hours on 11th March & 7th July 2005, using this study's standard approach described in Section 2.3. This included:
 - Description of the structural and floristic composition of the native vegetation;
 - Compilation of lists of indigenous and introduced plant species in each the site's polygons, including the species' abundances and the threat level of all weed species in each area;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Verbal information about the site's recent flora species from local naturalist, Ken Duxbury;
- Kern L., Gannon P. and Muir A. (2000). 'Flora and Vegetation Mapping on Waterways in the City of Boroondara, Victoria: Yarra River'. Report to the City of Boroondara. 30 + i pages;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

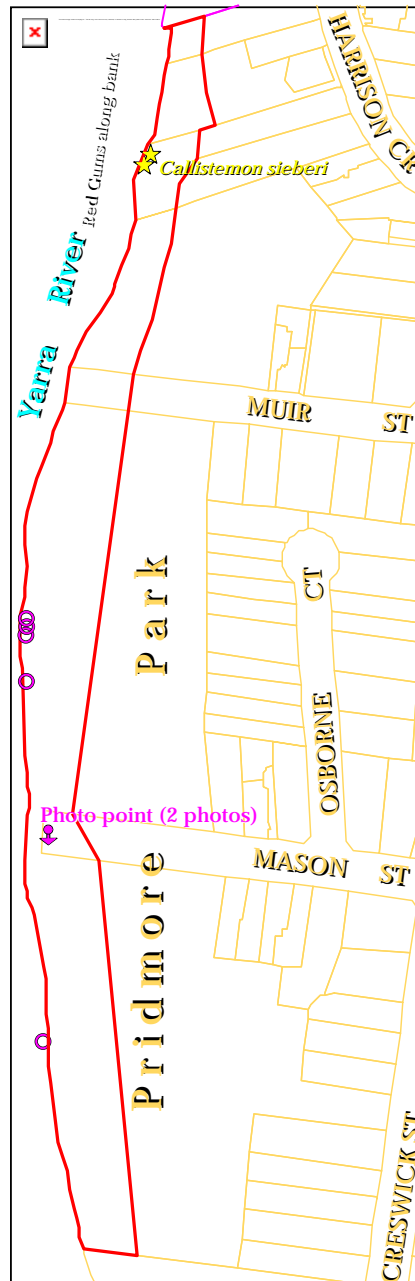
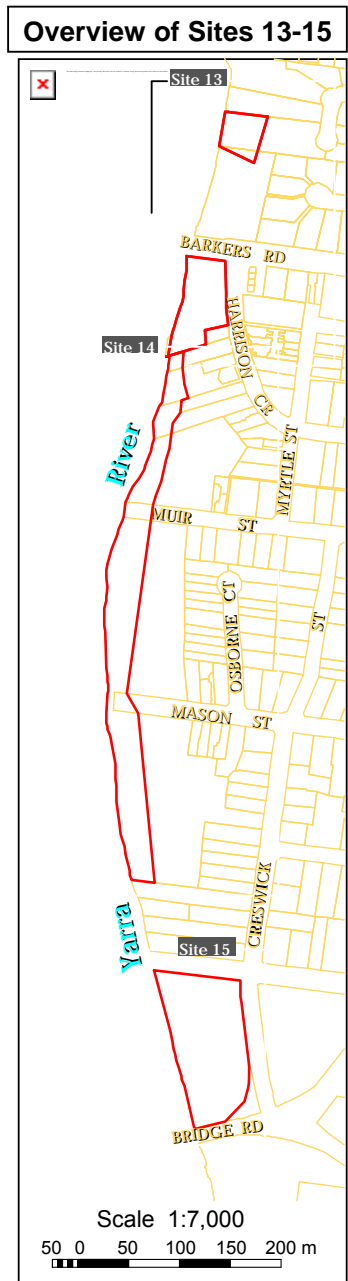
Site 14. Pridmore Park Riverbank, Hawthorn

Revegetated riverbank along a Council amenity park. Melway ref. 44 J8.

Site Biological Significance Level: *Local*

Summary of significant natural assets:

- Three locally threatened plant species, two of which are rare or threatened throughout the Melbourne area;
- Young revegetation that is likely to soon fill a serious gap in the vegetation corridor along the lower Yarra River;
- Vestiges of the endangered Ecological Vegetation Class, Riparian Woodland.



Boundaries

The site is the revegetated western edge of Pridmore Park, as well as adjacent public land linking the park to Harrison Crescent Reserve (Site 13). The boundary is marked in red on the right-hand aerial photograph above. The southern edge,

and all edges north of Muir St, are property boundaries. The western edge is the normal water level of the Yarra River. The eastern edge within Pridmore Park comprises three straight line segments that envelope all the revegetation areas.

Land use & tenure: Council amenity park.

Physical features

Site area: 1.370-53 hectares

Elevation: The normal water level for the Yarra River ~~is at an elevation of and billabong is at an elevation of 1.6 m.~~ The elevation at the top of the embankment of the river channel is typically 6m. The highest elevation is 8 m. ~~The elevation of the roadway is approximately xx0 m.~~

Landform: Riverbank.

Slope: The embankment of the river channel has a typical gradient of 1:1.2. ~~The floodplain is generally flat, but it slopes down sharply at the river and on the southern and eastern banks of the billabong. Within a distance of typically 20 m of the National Guide Dog Centre, the slope increases to a maximum gradient of 1:9.~~ Elsewhere, the gradient is slight.

Soil type: Alluvium, except for a narrow strip of thin, light grey loam on the eastern margin, north of Muir St.

Underlying geology: The bedrock is Silurian sedimentary rock of the Dargile formation, which formed the loam mentioned above.

Site description

This site has little remnant native vegetation but has been revegetated with indigenous species in the last few years or so. The revegetation is of particular ecological importance because Pridmore Park has been a major gap in the vegetation corridor along the lower Yarra River.

The River Red Gums (*Eucalyptus camaldulensis*) that lined the whole length of the lower Yarra River prior to European settlement are now represented in this site by only a strip approximately 60 m long in the north of the site (as shown on the right-hand aerial photograph), plus one young individual near Muir St and another near the extension of Mason St. The original dense Silver Wattles (*Acacia dealbata*) have been totally removed. Very few natural understorey plants are more than a few years old, but they are predominantly of locally threatened species. There has also been extensive germination of indigenous *Persicaria* species following the floods of summer 2004-5.

Revegetation appears to have commenced roughly a decade ago on the eastern side of the riverbank footpath, mainly with wattles and some non-indigenous eucalypts. A much denser and more diverse planting occurred on the embankment of the river roughly two years ago, followed up with more planting in 2004. The revegetation is growing well and should bridge the gap in the Yarra River's vegetation corridor, provided that routine weed control is undertaken.

Ecological links with other land

There is an almost unbroken vegetated corridor extending upstream along the Yarra River, beginning with the abutting Site 13 and extending far beyond Boroondara. There is also a narrower and more fragmented vegetation corridor downstream, including the nearby Site 15. Certain bird species, such as cormorants and White-faced Heron, migrate along the river and its vegetated margins.

Mature eucalypts within Pridmore Park, east of the strip that is included in the site considered here, provide rudimentary habitat for some native birds such as the White-plumed Honeyeater.

Habitat type

Riparian Woodland (EVC 641, **endangered** in the Gippsland Plain bioregion), reduced to vestiges. (The pre-European vegetation may also have included a patch of Floodplain Riparian Woodland or an intermediate vegetation type.)

Canopy trees: *Eucalyptus camaldulensis*, moderately dense in a strip c. 60 m long in the north of the site (as shown on the right-hand aerial photograph), plus one young individual near Muir St and another near the extension of Mason St.

Lower trees: No naturally occurring lower trees remain. *Acacia dealbata* would once have been abundant, and many have been planted.

Shrubs: The characteristic riverside species, *Callistemon sieberi*, is represented by two adjacent individuals. No other natural shrubs remain. Many indigenous shrubs have been planted in the past two years or so, including *Acacias*, *Goodenia ovata*, *Kunzea ericoides*, *Leptospermums*, *Melicytus dentatus*, *Ozothamnus ferrugineus*, *Solanum laciniatum*, *Viminaria juncea*.

Vines: None.

Ground flora: The naturally occurring indigenous ground flora includes fairly abundant *Persicarias* (three species) and scattered plants of *Juncus usitatus* and *Schoenoplectus tabernaemontani*. There are also plants of *Alternanthera denticulata* and *Lachnagrostis avenacea* that may or may not be natural. Numerous indigenous ground flora plants have been planted in the past two years or so, dominated by *Lomandra longifolia*. North of Muir St, the planting has also included large numbers of *Microlaena stipoides*. South of Muir St, the most abundant planted species are *Dianella longifolia* s.l., *Einadia nutans*, *Juncus amabilis* and *Poa labillardierei*.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Notes
Melbourne	Boroondara		
Rare or threatened	Critically Endangered	<i>Schoenoplectus tabernaemontani</i>	Five young plants, apparently not planted.
Rare or threatened	Vulnerable	<i>Juncus usitatus</i>	Numerous north of Muir St, scarce to the south.
	Endangered	<i>Callistemon sieberi</i>	Two adjacent individuals (or perhaps both off one rootstock).

Full flora list

The following table lists the ten species of wild indigenous plants, 37 planted species (most of which are indigenous) and 26 species of weeds found at the site during this study. The column headed 'North' contains entries for species found north of Muir St and the column headed 'south' is for the remainder of the site. Within these columns, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Species with underlined names represent an important resource for collection of seed or cuttings.

Species Name	South	North	Species Name	South	North	Species Name	South	North
Wild indigenous species			<i>Dianella longifolia</i> s.l.	M	✓	Weeds		
<i>Alternanthera denticulata</i>	✓		<i>Dodonaea viscosa</i>	✓	✓	<i>Araujia sericifera</i>		-
<i>Callistemon sieberi</i>		-	<i>Einadia nutans</i>	D	-	<i>Aster subulatus</i>	✓	
<i>Eucalyptus camaldulensis</i>	-	D	<i>Eucalyptus camaldulensis</i>	-		<i>Atriplex prostrata</i>	M	
<i>Juncus usitatus</i>	-	M	<i>Eucalyptus ovata</i>		-	<i>Brassica fruticulosa</i>	✓	✓
<i>Lachnagrostis filiformis</i>	✓	✓	<i>Eucalyptus polyanthemos</i>	-	-	<i>Bromus catharticus</i>	-	-
<i>Persicaria decipiens</i>	✓		<i>Eucalyptus sp.</i>	✓		<i>Conyza sumatrensis</i>	✓	✓
<i>Persicaria hydropiper</i>	M		<i>Goodenia ovata</i>	✓	✓	<i>Cynodon dactylon</i>	-	✓
<i>Persicaria laphathifolia</i>	M		<i>Juncus amabilis</i>	M		<i>Cyperus eragrostis</i>	✓	
<i>Portulaca oleracea</i>	M		<i>Juncus gregiflorus</i>	✓		<i>Dactylis glomerata</i>		-
<i>Schoenoplectus tabernaemontani</i>	-		<i>Juncus subsecundus</i>		-	<i>Echinochloa ?crus-galli</i>	✓	
Planted species			<i>Kunzea ericoides</i> sp. agg.	✓		<i>Ehrharta erecta</i>		✓
<i>Acacia acinacea</i> sp.	✓	✓	<i>Leptospermum lanigerum</i>	✓		<i>Eragrostis mexicana</i>	✓	
<i>Acacia dealbata</i>	M	-	<i>Leptospermum ?obovatum</i>		✓	subsp. <i>virescens</i>		
<i>Acacia implexa</i>	✓		<i>Leptospermum scoparium</i>		-	<i>Fraxinus angustifolia</i>	✓	✓
<i>Acacia mearnsii</i>	✓	✓	<i>Lomandra longifolia</i>	D	D	<i>Modiola caroliniana</i>	M	✓
<i>Acacia melanoxydon</i>	✓		<i>Melicytus dentatus</i>	✓	✓	<i>Pennisetum clandestinum</i>	✓	
<i>Acacia pycnantha</i>		-	<i>Microlaena stipoides</i>		M	<i>Persicaria maculosa</i>	✓	
<i>Acacia verticillata</i>		✓	<i>Ozothamnus ferrugineus</i>		✓	<i>Piptatherum miliaceum</i>	✓	✓
<i>Allocasuarina verticillata</i>	✓	✓	<i>Poa labillardierei</i>	M	✓	<i>Polygonum aviculare</i>	✓	✓
<i>Austrodanthonia racemosa</i>		✓	<i>Pomaderris aspera</i>		✓	<i>Robinia pseudoacacia</i>		D
<i>Austrodanthonia setacea</i>		✓	<i>Solanum laciniatum</i>	✓		<i>Rubus ?anglocandicans</i>		-
<i>Callistemon sieberi</i>	✓	✓	<i>Viminaria juncea</i>		✓	<i>Salpichroa organifolia</i>		✓
<i>Carex appressa</i>	✓		<i>Wahlenbergia ?communis</i>		✓	<i>Solanum nigrum</i>		M
<i>Carex tereticaulis</i>	✓					<i>Sonchus oleraceus</i>	-	
						<i>Tradescantia fluminensis</i>		✓
						<i>Ulmus</i> sp.		-
						<i>Verbena bonariensis</i>	-	

Fauna of special significance

A single White-faced Heron was the only significant fauna species observed during the inspection of this site, which lasted less than 1½ hours. This species has a conservation status rating in Boroondara of 'vulnerable', whose meaning is explained in Section 2.5.2 (page 18).

Full fauna list

The following list contains all fauna species found by the author during the inspection of this site and for approximately 200 m to the north and south. Asterisks indicate introduced species.

Butterflies		Birds		Birds (continued)	
*Cabbage White	2005	White-faced Heron	2005	Noisy Miner	2005
Common Brown	2005	Dusky Moorhen	2005	White-plumed Honeyeater	2005
Common Grass-blue	2005	Silver Gull	2005	Willie Wagtail	2005
		*Spotted Turtle-Dove	2005	Australian Magpie	2005
		Brush Wattlebird	2005	*Common Blackbird	2005
		Bell Miner	2005	*Common Myna	2005

Fauna habitat

Fauna habitat in this site is rudimentary, but will become much better as the revegetation matures. In the medium term, the revegetation should provide habitat for small honeyeaters such as the Eastern Spinebill (which was observed nearby), and in the long term, it could provide habitat for the White-browed Scrubwren and Superb Fairy-wren.

Site significance ratings

The following is an assessment of the site against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to this site.

The site also qualifies as locally significant under BioSites criterion 1.3 as a '*Cleared or degraded area which may with suitable habitat reconstruction or rehabilitation work form a strategically important corridor...of local importance and scale*'.

Regionally threatened Ecological Vegetation Class

According to the criteria of '*Victoria's Native Vegetation Management – A Framework for Action*' (NRE 2002a), any native vegetation belonging to an endangered EVC such as Riparian Woodland has a conservation significance rating of either High or Very High. The area of native vegetation in the site of interest here is too small and degraded to qualify as a 'remnant patch' for the purposes of BioSites criterion 3.2.3, which would otherwise indicate that the site is of state significance.

Rare or threatened plants

At least one locally threatened plant species (*Juncus usitatus*) has a viable population within the site. Any such species gives the site **Local** significance according to BioSites criterion 3.1.5. The five plants of *Schoenoplectus tabernaemontani* also qualify as locally significant if they are regarded as part of a viable, larger population along the edge of the Lower Yarra.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threat to the site's ecological values is presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
<p>Environmental weeds. The species of concern are:</p> <ul style="list-style-type: none"> • Serious: Couch (<i>Cynodon dactylon</i>), Locust Tree (<i>Robinia pseudoacacia</i>), Wandering Jew (<i>Tradescantia fluminensis</i>); • Moderately serious: White Bladder-flower (<i>Araujia sericifera</i>), Hastate Orache (<i>Atriplex prostrata</i>), Twiggy Turnip (<i>Brassica fruticulosa</i>), Prairie Grass (<i>Bromus catharticus</i>), Fleabane (<i>Conyza sumatrensis</i>), Drain Flat-sedge (<i>Cyperus eragrostis</i>), Cocksfoot (<i>Dactylis glomerata</i>), Common Barnyard Grass (<i>Echinochloa ?crusgalli</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Mexican Love-grass (<i>Eragrostis mexicana</i> subsp. <i>virescens</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Carolina Mallow (<i>Modiola caroliniana</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Persicaria (<i>Persicaria maculosa</i>), Rice Millet (<i>Piptatherum miliaceum</i>), Prostrate Knotweed (<i>Polygonum aviculare</i> s.l.), Blackberry (<i>Rubus ?anglocandicans</i>), Pampas Lily-of-the-Valley (<i>Salpichroa organifolia</i>), Black Nightshade (<i>Solanum nigrum</i>), Elm (<i>Ulmus</i> sp.), Purple-top Verbena (<i>Verbena bonariensis</i>). 	All	Moderate	Current

Priority action

The only important action for the short term is routine weed control among the revegetation.

Future revegetation

The deciduous trees visible on the aerial photographs beside the Yarra River at the southern extremity of the site should eventually be replaced by indigenous vegetation. This would improve the continuity of native vegetation along the corridor. The urgency and importance of such revegetation are low on a municipal scale.

If the expanse of lawn in the park is deemed unnecessarily large, part of it could be used for creation of a wetland, as suggested in the report by Kern *et al.* (2000) whose bibliographic details are given below. However, the plant species listed in that report as being characteristic of Floodplain Wetland Complex should not be relied upon as appropriate for this particular site; Instead, use Appendix C.

Monitoring

The report by Kern *et al.* (2000, see details below) includes quadrat data gathered in June 2000 from a revegetation plot south of the extension of Mason St, apparently the one depicted in Photo 2 on the next page, on the eastern side of the riverside footpath. The quadrat data will allow comparison with updated data in future to see how the revegetation is developing. This could be useful in 2-5 years time. The area of the quadrat is stated to be 30 m², which is clearly wrong; It appears that the whole revegetation plot was assessed.

The following additional items have been gathered to provide a baseline for future monitoring:

- The two photographs displayed below, for monitoring development of the revegetation. Original digital images are available separately. Repeat the photographs about every two years. Check the growth of the revegetation and weeds;
- Flora lists for two parts of the site, as presented beneath the heading 'Full flora list' above;
- Ratings of weed severity within each of these two parts of the site, stored in the database of this study;
- Population sizes of scarce plant species: Two adjacent *Callistemon sieberi* and five *Schoenoplectus tabernaemontani* as marked on the right hand aerial photograph on page 172. Check the populations every two to four years.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of approximately 1½ hours on 11th March 2005, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous, planted and introduced plant species (separately for north and south of Muir St), including the species' abundances and the threat level of all weed species in each area;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally (including each remnant River Red Gum);
 - Photography for monitoring;

- Incidental fauna observations; and
- Checks for fauna habitat, ecological threats and management issues;
- Kern L., Gannon P. and Muir A. (2000). *'Flora and Vegetation Mapping on Waterways in the City of Boroondara, Victoria: Yarra River'*. Report to the City of Boroondara. 30 + i pages;
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

No further investigation is recommended for this site.

Monitoring photographs, taken on 11th March 2005

The locations and orientations of the photographs are shown by numbered arrows on the inset on page 172.



Site 14, Photo 1. A southward view across the young revegetation the upper river embankment at the closest point to the playground. The vegetation is likely to soon become so dense as to obstruct visibility beyond a few metres, so Photo 2 was taken as a more enduring baseline.



Site 14, Photo 2. As for Photo 1, but taken from just over one metre further east. The revegetation on the left (east) of the footpath was apparently used by Kern *et al.* (2000) for their Quadrat 2.

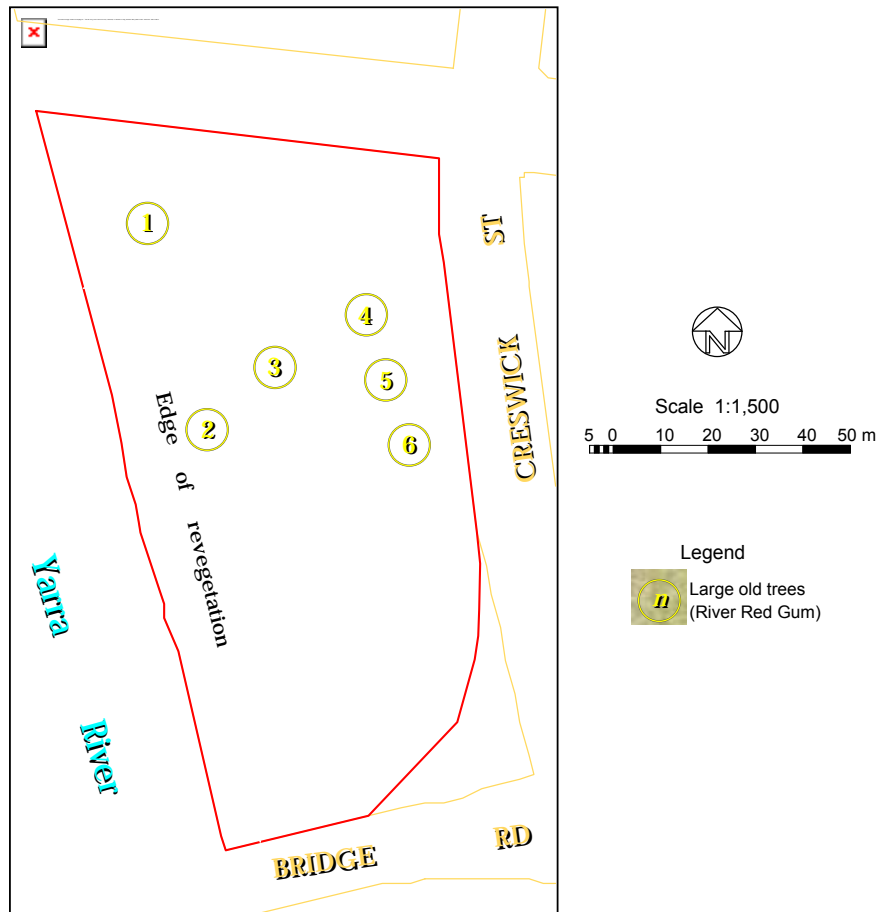
Site 15. Yarra Bank Reserve, Hawthorn

Council riverbank amenity park with ancient River Red Gums, revegetation and garden plantings. Melway ref. 44 J9.

Site Biological Significance Level: *Local*

Summary of significant natural assets:

- Part of a somewhat fragmented ecological corridor along the lower Yarra River, with the likelihood of improved continuity through revegetation;
- Six large old River Red Gums, mostly in good health.



Boundaries

This site is the whole of Yarra Bank Park, as outlined in red on the aerial photograph.

Land use & tenure: Council amenity park.

Physical features

Site area: ~~10-53~~ hectares

Elevation: The normal water level for the Yarra River ~~and billabong~~ is at an elevation of ~~16~~ m. The maximum elevation of ~~15 m~~ is ~~near the Bridge Rd off-ramp into Creswick St of the roadway is approximately xx0 m.~~

Landform: Riverbank and lower valley slope.

Slope: ~~The reserve has a~~ steep west-facing gradient of 1:1.2 in a strip 4-5 m wide beside ~~the Yarra~~ River, and also in a strip of similar width abutting Creswick St. The remainder of the site has a gentle gradient of typically 1:10, gradually increasing toward the east. ~~The floodplain is generally flat, but it slopes down sharply at the river and on the southern and eastern banks of the billabong. Within a distance of typically 20 m of the National Guide Dog Centre, the slope increases to a maximum gradient of 1:9.~~

Soil type: Alluvium over most of the reserve, changing to shallow, light grey loam on the steeper slope near Creswick St.

Underlying geology: The bedrock is Silurian sedimentary rock of the Dargile formation, which formed the loam mentioned above.

Site description

This site's remnant native vegetation is limited to:

- Six large River Red Gums (*Eucalyptus camaldulensis*) that are centuries old, mostly in good health;
- Very few Creeping Mistletoe plants (*Muellerina eucalyptoides*) growing on these six large River Red Gums; and
- Fourteen River Red Gums with typical trunk diameter 30cm (probably well under one century old) located several metres from the river. These trees are in fair to good health, possibly not thriving due to historical factors or competition with exotic trees.

Indigenous plants have also been planted recently among the fourteen younger River Red Gums, forming a revegetation area measuring 120 metres long by typically five metres wide. In years to come, this revegetation should improve the continuity of native vegetation cover along the river, and hence improve the associated ecological corridor.

The reserve also has old exotic trees, other ornamental garden plants, lawns and visitor facilities.

Ecological links with other land

The corridor of vegetation along this stretch of the Yarra River is heavily punctuated by gaps and patches of deciduous trees. This impairs the value of the corridor for movement of native wildlife, pollen and seeds. Nevertheless, certain native bird species, such as White-plumed Honeyeater, cormorants and White-faced Heron, were observed migrating along the river, often pausing where there is native vegetation. The nearest site to the north with native vegetation (mainly revegetation) is Pridmore Park (Site 14, see page 172), less than 100 m away. The native vegetation to the south is more fragmented and there is a gap of one kilometre to Site 16.

Habitat types

The pre-European vegetation was Riparian Woodland (EVC 641) on the alluvium and Plains Grassy Woodland (EVC 55) on the slope next to Creswick St, but these are now represented only by the small number of indigenous plants mentioned above.

Flora of special significance: None.

Full flora list

The following table includes the two naturally occurring indigenous plant species, twelve planted indigenous plant species and three environmental weed species found at Yarra Bank Reserve during this study. In the column headed 'Abundance', 'D' indicates a dominant species; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found.

Species Name	Abundance	Species Name	Abundance	Species Name	Abundance
Wild indigenous species		<i>Acacia verticillata</i>	-	Weed species	
<i>Eucalyptus camaldulensis</i>	D	<i>Allocasuarina verticillata</i>	-	<i>Ehrharta erecta</i>	✓
<i>Muellerina eucalyptoides</i>	-	<i>Cassinia longifolia</i>	-	<i>Hedera helix</i>	✓
Planted indigenous species		<i>Chrysocephalum semipapposum</i>	✓	<i>Quercus robur</i>	M
<i>Acacia implexa</i>	✓	<i>Dodonaea viscosa</i>	✓		
<i>Acacia mearnsii</i>	✓	<i>Lomandra longifolia</i>	M		
<i>Acacia melanoxylon</i>	✓	<i>Poa labillardierei</i>	M		
		<i>Solanum laciniatum</i>	-		
		<i>Wahlenbergia ?communis</i>	✓		

Large old trees

Six River Red Gums (*Eucalyptus camaldulensis*) at Yarra Bank Reserve qualify as large old trees according to the Department of Sustainability & Environment's criterion for Riparian Woodland (i.e. trunk diameters of at least 0.8 m).

They are marked on the aerial photograph on page 178 with numbered yellow circles. Their characteristics are tabulated below.

Tree number on aerial photograph	1	2	3	4	5	6
Trunk diameter	110 cm	85 cm	109 cm	105 cm	115 cm	98 cm
Health	Good	Fair	Good	Good	Good	Fair to good

Fauna of special significance: None.

Full fauna list

A single list of fauna was compiled for this site and nearby Pridmore Park. It is presented on page 175.

Fauna habitat

The six large River Red Gums may be used as nesting sites by native birds such as the White-faced Heron, and possibly also for roosting by bats, but no evidence of this was seen (not surprisingly, given the time of year of the inspection, in March 2005).

Site significance ratings

The following is an assessment of the site against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

The site qualifies as **Locally** significant under BioSites criterion 1.3 as a '*Cleared or degraded area which may with suitable habitat reconstruction or rehabilitation work form a strategically important corridor...of local importance and scale*'.

BioSites criterion 1.1.1 attributes local significance to 'All parts of riparian systems with riparian vegetation present'. The River Red Gums at Yarra Bank Reserve are scarcely sufficient to be deemed 'riparian vegetation'.

Large trees

The BioSites criteria do not recognise any biological significance of isolated trees, regardless of their size (except for rare individuals that have particular importance to science). This should not be taken to imply that the centuries-old trees at Yarra Bank Reserve are not significant when considered against criteria related to heritage or aesthetics.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as the ones of interest here. However, the latest version states, '*Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats*'. The last sentence is not correct in the present site or in Boroondara more generally.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: English Oak (<i>Quercus robur</i>); • Moderately serious: Panic Veldt-grass (<i>Ehrharta erecta</i>), Ivy (<i>Hedera helix</i>). 	All	Moderate	Current
Eucalypt dieback disease due to psyllids, leaf skeletonisers or leaf miners.	Large old trees; Wildlife corridor	Moderate	Current

Priority action

Remove the parasitic fig (*Ficus coronata*) from the tree numbered 6 on the aerial photograph on page 175.

Past management and revegetation

The large old River Red Gums are generally well cared for.

A strip of revegetation from the past few years is marked on the aerial photograph on page 175, beside the river. The planting occurred among remnant River Red Gums and oaks (some planted, some probably volunteers).

There has been a program of staged removal of oaks along the riverbank over the past three years.

Future revegetation

The existing revegetation is at some risk from competition by Ivy, Panic Veldt-grass and the established trees. Conversely, the pre-existing River Red Gums amid the revegetation are already in imperfect health and may be further compromised by increasing competition from the revegetation as well as the oaks.

The focus of revegetation for the foreseeable future should therefore be on fostering the growth of the existing revegetation and the associated remnant eucalypts. This requires periodic monitoring and removal of the aforementioned weeds. The oaks could be moved progressively as the native vegetation grows.

The opportunity for revegetation further from the river is limited because of the importance of the park for recreation and its amenity as a somewhat formal garden.

Monitoring

None of the pre-existing documentation or data examined in this study provides a basis for comparing present conditions with past conditions at this site.

The following items have been gathered to provide a baseline for future monitoring:

- The flora list provided beneath the heading 'Full flora list' above;
- Ratings of weed severity, as recorded beneath the heading 'Threats' above;
- Tree health ratings, as tabulated above and stored in the geographic information system data from this study.

Because of the density of vegetation in the revegetation strip, the health of the indigenous species should be monitored at least annually, with a view to thinning oaks and removing Ivy and Panic Veldt-grass to relieve pressure from the indigenous species.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of approximately 45 minutes on 11th March 2005, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species, including the species' abundances and the threat level of all weed species;
 - Individual measurement and health assessment of large old trees;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

No further investigation is recommended for Yarra Bank Reserve.

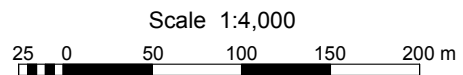
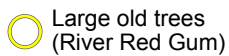
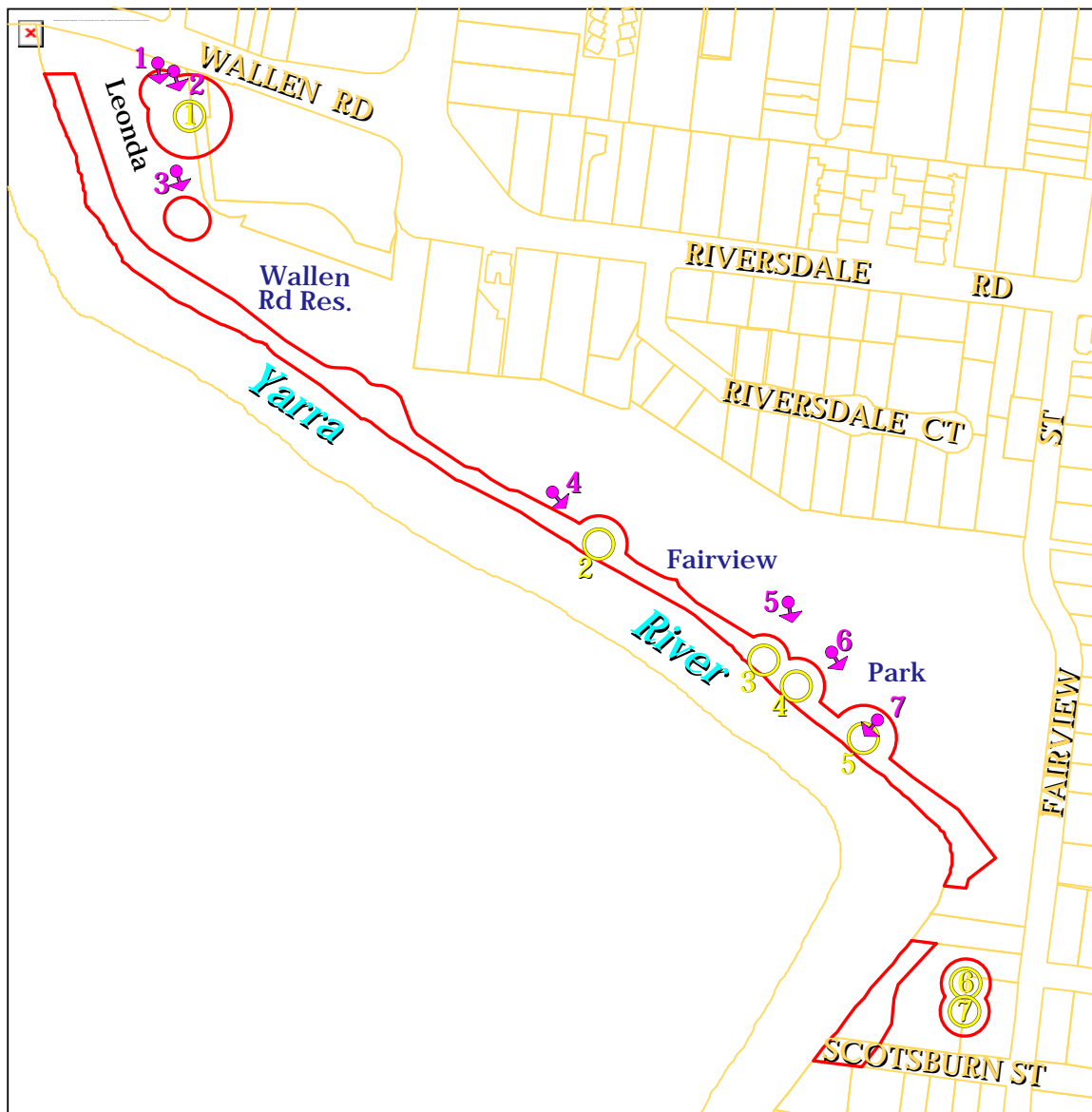
Site 16. Riverbank, Fairview Park Area, Hawthorn

Council riverbank sports and recreation park with remnant trees, revegetation, ovals and garden plantings.
Melway ref. 45 A12 to 59 B1.

Site Biological Significance Level: *Local*

Summary of significant natural assets:

- Part of a rather fragmented ecological corridor along the lower Yarra River, with the likelihood of improved continuity as recent revegetation matures;
- Populations of three plant species that are locally threatened, at least one of which is quite viable;
- Seven large old River Red Gums, mostly in good health.



Boundaries

This site comprises the following disconnected sections, each outlined in red above:

- A 750-metre-long strip of riverbank from 25 metres downstream of the Hawthorn Bridge (beside the Leonda restaurant) to the fence of the private residence abutting the southern edge of Fairview Park. (The residence just mentioned appears to be on the same allotment as the park.) The strip lies between the river and the footpath at the top of the riverbank, except for diversions around four large old River Red Gums in Fairview Park. The arcs have radii calculated as 18 times the diameter of the trunk of each tree, using the formula of Matheny and Clark (1998) for Tree Protection Zones of over-mature trees that are sensitive to root disturbance;
- A 90-metre-long strip of riverbank at Scotsburn Street Reserve, circumscribing the tree canopy beside the river;
- A pair of overlapping circles representing Tree Protection Zones of radius 14.6 metres centred on two large, old River Red Gums on or near the border of Scotsburn St Reserve and 9 Scotsburn St (Lot 37 LP6222). The quoted radius was determined as 18 times the diameter of the trunk of one of the trees, using the Matheny and Clark (1998) formula cited above;
- Two shapes in the car park of the Leonda restaurant and Wallen Reserve, representing all points within the Tree Protection Zones of five River Red Gums (calculated the same way as the other trees mentioned above).

Although the three River Red Gums immediately southeast of the Leonda Restaurant are not over-mature, the factor of 18 was still applied for their Tree Protection Zones because of the risks faced by these trees due to their situation in a car park.

Land use & tenure: Public riverbank fringing Council parks and the Leonda restaurant. There is also a jetty.

Physical features

Site area: 1.7 hectares

Elevation: The normal water level of the Yarra River is at an elevation of 1 m, and the top of the bank is at an elevation of 5-6 m. The trees close to Wallen Rd are at an elevation of 10 m.

Landform: Riverbank.

Slope: The riverbank has a steep slope of 1:1.5, with an abrupt change to almost level ground beyond a typical distance of eight metres from the water.

Soil type: Alluvium.

Underlying geology: The bedrock is Silurian sedimentary rock of the Dargile formation, which formed the escarpment to the northeast of Wallen Road Reserve and Fairview Park.

Site description

This riverbank site has only scattered remnant native vegetation, but it has been recently given extensive weed control and revegetation to help restore the ecological corridor along the lower Yarra River.

The remnant vegetation includes River Red Gums (*Eucalyptus camaldulensis*), a modest number of Silver Wattles (*Acacia dealbata*) and some hardy ground flora (mostly at the water's edge). The eucalypts include some very old trees, in good to very good health.

The site also has old oaks, elms, poplars and Spotted Gums (*Corymbia maculata*). The adjacent land includes ovals, parkland, car park and the Leonda restaurant. The site is interrupted by two residential properties fronting Fairview St.

Ecological links with other land

The corridor of vegetation along the Yarra River from Gardiners Creek to Barkers Rd is heavily punctuated by gaps and patches of deciduous trees. This impairs the value of the corridor for movement of native wildlife, pollen and seeds. Nevertheless, White-plumed Honeyeaters were observed moving through this site and along the river, and it is likely that they derive the rest of their habitat needs primarily from other areas of eucalypts along the Yarra River, such as on the opposite bank and at Scotch College (Site 17). Little Black Cormorants were also observed at the site, and they rely on moving along the river well beyond the site. Many other fauna recorded on the site similarly rely on other riparian habitat (particularly River Red Gums) upstream and downstream. Some fauna species at the site can make extensive use of surrounding residential gardens (e.g. Willie Wagtail and Grey Butcherbird).

Habitat type

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion)

Only approximately 0.4 ha of the site has enough native understorey to be regarded as a representation of Floodplain Riparian Woodland, and then only because of young revegetation. This area includes 9 wild indigenous plant species, 16 planted species and 13 introduced plant species.

Canopy trees: A pure stand of *Eucalyptus camaldulensis*, with crowns overlapping slightly.

Lower trees: *Acacia dealbata* is represented by very some naturally occurring individuals (reduced by historical clearing) and substantial numbers of planted individuals. *Acacia implexa* has also been planted in large numbers, and some may also be naturally occurring (judging from the plant list of Kern *et al.*^{*}).

Shrubs: All woody shrubs present are planted, and include *Meliccytus dentatus* (= *Hymenanthera dentata*), *Dodonaea viscosa*, *Kunzea ericoides* s.l., *Solanum laciniatum* and *Viminaria juncea*.

Shrubby herbs: The small, herbaceous shrub *Persicaria hydropiper* was moderately common in early 2005, but its numbers will fluctuate according to time since floods.

Vines: None.

Ferns: None.

Ground flora: The water's edge has substantial numbers of *Juncus usitatus* and *Phragmites australis*, and a patch of *Typha*. Further up the banks, large numbers of the seasonal species, *Juncus bufonius*, were found in summer. Planted indigenous ground flora include *Dianella longifolia* s.l., *Juncus gregiflorus*, *Linum marginale*, *Microlaena stipoides* and *Poa labillardierei*.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status rating, 'Vulnerable', is explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Notes
Melbourne	Boroondara		
Rare or threatened	Vulnerable	<i>Juncus usitatus</i>	Rather abundant at the water's edge
	Vulnerable	<i>Phragmites australis</i>	Rather abundant at the water's edge
	Vulnerable	<i>Typha</i> sp.	A modest presence at the water's edge

Full flora list

The following table includes the plant species found in the site during this study. In the column headed 'Abundance', 'D' indicates a dominant species; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found.

Species Name	Abundance	Species Name	Abundance	Species Name	Abundance
Wild indigenous species					
<i>Acacia dealbata</i>	✓	<i>Dianella longifolia</i> s.l.	✓	<i>Quercus robur</i>	✓
<i>Eucalyptus camaldulensis</i>	-	<i>Dodonaea viscosa</i>	-	<i>Ulmus</i> sp.	✓
<i>Juncus bufonius</i>	D	<i>Eucalyptus camaldulensis</i>	M	Weed species	
<i>Juncus usitatus</i>	M	<i>Juncus gregiflorus</i>	✓	<i>Aster subulatus</i>	✓
<i>Muellerina eucalyptoides</i>	✓	<i>Kunzea ericoides</i> spp. agg.	-	<i>Atriplex prostrata</i>	✓
<i>Persicaria hydropiper</i>	✓	<i>Linum marginale</i>	✓	<i>Delairea odorata</i>	-
<i>Phragmites australis</i>	M	<i>Meliccytus dentatus</i>	-	<i>Ehrharta erecta</i>	-
<i>Portulaca oleracea</i>	M	<i>Microlaena stipoides</i>	✓	<i>Foeniculum vulgare</i>	-
<i>Typha</i> sp.	M	<i>Poa labillardierei</i>	✓	<i>Fraxinus angustifolia</i>	-
Planted indigenous species					
<i>Acacia dealbata</i>	M	<i>Solanum laciniatum</i>	-	<i>Hedera helix</i>	-
<i>Acacia implexa</i>	M	<i>Viminaria juncea</i>	-	<i>Pennisetum clandestinum</i>	D
<i>Acacia mearnsii</i>	✓	Other planted species			
		<i>Acacia saligna</i>	-	<i>Phalaris aquatica</i>	✓
		<i>Corymbia maculata</i>	✓	<i>Tradescantia fluminensis</i>	-
		<i>Populus alba</i>	-		

The report on this area by Kern *et al.* (2000) also lists *Bursaria spinosa*, *Juncus subsecundus* and *Melaleuca ericifolia*. The *Juncus* is almost certainly a misidentification of *Juncus usitatus*, which is abundant at the site but not recorded by Kern *et al.* The other two species were not found by the present author, and if they were indeed present in 2000, they could have been outside the site boundary used here. Note also that Kern *et al.* drew no distinction between whether plants were naturally occurring or planted.

* Kern L., Gannon P. and Muir A. (2000). 'Flora and Vegetation Mapping on Waterways in the City of Boroondara, Victoria: Fairview Park'. Practical Ecology Pty Ltd, Preston. i + 14 pp.

Large old trees

Seven River Red Gums (*Eucalyptus camaldulensis*) in the site qualify as large old trees according to the Department of Sustainability & Environment's criterion for Riparian Woodland (i.e. trunk diameters of at least 0.8 m). These are each circled in yellow and numbered on the aerial photograph page 182. Their characteristics are tabulated below.

Tree no. on aerial photograph	1	2	3	4	5	6	7
Trunk diameter	137 cm	93 cm	83 cm	92 cm	108 cm	81 cm	c. 80 cm
Health	Very Good	Good	Good	Very Good	Good	Very Good	Very Good

The trunk diameter of tree 7 could only be estimated because the trunk is partly on private land.

Tree 5 contains hollows. No hollows could be seen in the other trees, but it is common for hollows to be undetectable from the ground.

Tree 5 also supports excessive mistletoe (*Muellerina eucalyptoides*), and an arborist's advice should be sought about reducing it.

Fauna of special significance

The significant fauna species in the list below have been observed at or near Fairview Park. The records dated 2005 were by the author. The conservation status ratings (e.g. Vulnerable or Occasional Visitor) are explained in Section 2.5.2 (page 18). No breeding was confirmed.

Conservation Status		Species Name	Last Record
Melbourne	Boroondara		
Near Threatened	Occasional Visitor	Peregrine Falcon	1999
	Vulnerable	Little Black Cormorant	2005
	Vulnerable	Laughing Kookaburra	2005
	Vulnerable	Black-faced Cuckoo-shrike	1988

The site would not meet any significant fraction of the habitat needs of a Peregrine Falcon or Black-faced Cuckoo-shrike.

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species.

Butterflies		Birds (continued)		Birds (continued)	
*Cabbage White	2005	Peregrine Falcon	1999	Black-faced Cuckoo-shrike	1988
		*Spotted Turtle-Dove	2005	Grey Butcherbird	1999
Mammals		Rainbow Lorikeet	2005	Australian Magpie	2005
Common Brushtail Possum	1993	Red-rumped Parrot	1988	Pied Currawong	1999
Common Ringtail Possum	1985	Laughing Kookaburra	2005	Little Raven	1999
		Red Wattlebird	1988	*House Sparrow	1999
Birds		Brush Wattlebird	2005	Welcome Swallow	2005
Australian Wood Duck	1999	Noisy Miner	2005	*Common Blackbird	1999
*Mallard	1999	White-plumed Honeyeater	2005	*Common Starling	2005
Pacific Black Duck	2005	Magpie-lark	2005	*Common Myna	2005
Little Black Cormorant	2005	Willie Wagtail	2005		

Site significance ratings

The following is an assessment of the site against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

The site qualifies as **Locally** significant under BioSites criterion 1.3 as a 'Cleared or degraded area which may with suitable habitat reconstruction or rehabilitation work form a strategically important corridor...of local importance and scale'.

BioSites criterion 1.1.1 attributes local significance to ‘All parts of riparian systems with riparian vegetation present’. The River Red Gums and revegetation in and near Fairview Park are scarcely sufficient to be deemed ‘riparian vegetation’, but this should soon change as the revegetation matures.

Regionally threatened Ecological Vegetation Class

According to the criteria of ‘Victoria’s Native Vegetation Management – A Framework for Action’ (NRE 2002a), any native vegetation belonging to an endangered EVC such as Floodplain Riparian Woodland has a conservation significance rating of either High or Very High. The native vegetation in the site of interest here is too small and fragmented to qualify as a ‘remnant patch’ for the purposes of BioSites criterion 3.2.3, which would otherwise indicate that the site is of state significance. However, the revegetation at maturity is likely to represent a sufficiently large and dense reconstruction of Floodplain Riparian Woodland that it may qualify for State significance in years to come.

Rare or threatened plants

The site’s population of the locally threatened *Juncus usitatus* is quite viable, particularly when considered as part of a larger, reproductively connected population along the lower Yarra River. Any locally threatened species with viable population gives a site **Local** significance according to BioSites criterion 3.1.5. The population of *Phragmites australis* would probably also qualify on the same basis, although the evidence of its viability is not as strong.

Large trees

The BioSites criteria do not recognise any biological significance of isolated River Red Gums, regardless of their size. This should not be taken to imply that the centuries-old trees in this site are not significant when considered against criteria related to heritage or aesthetics.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age. However, the latest version states, ‘Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats’. The last sentence is not correct in the present site or in Boroondara more generally.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of Victoria’s Native Vegetation Framework (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site’s ecological values are presented in a form to suit the Department of Sustainability & Environment’s ‘BioSites’ database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Kikuyu (<i>Pennisetum clandestinum</i>) and (to a lesser extent) Toowoomba Canary-grass (<i>Phalaris aquatica</i>); • Moderately serious: Hastate Orache (<i>Atriplex prostrata</i>), Cape Ivy (<i>Delairea odorata</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Fennel (<i>Foeniculum vulgare</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Ivy (<i>Hedera helix</i>), Wandering Jew (<i>Tradescantia fluminensis</i>). 	All	Moderate	Current
Eucalypt dieback disease associated with psyllids and/or leaf miners. Psyllids were active at the time of this study’s site inspection.	River Red Gums	Low to Moderate	Current
Parasitism of eucalypts by mistletoe.	River Red Gums	Low to Moderate	Current

Priority actions

1. Follow-up control of environmental weeds in the revegetation areas;
2. Seek expert arboricultural advice about the desirability of reducing the amount of mistletoe on River Red Gums numbered 2 and 5 on the aerial photograph on page 182;
3. With rather lower priority and urgency, consider removal of the *Schinus molle* in Photo 3 on page 188 so that the adjacent River Red Gums have a better chance to survive and thrive.

Past management and revegetation

There has been extensive weed removal and revegetation in the last few years. Paths and unobtrusive barriers have been positioned to reduce human impact on the root zones of the large old River Red Gums.

Future revegetation

There is adequate revegetation for the time being. In the next few years, there may be a need to put in some additional plants here and there among the existing revegetation where the density of surviving plants is found to be too low.

The report on this area by Kern *et al.* (2000) proposes the creation of stormwater wetlands to the north of the ovals, just outside the boundaries of the site circumscribed for the present report. A main aim of this proposal was to reduce waterlogging of the ovals. The concept of reducing waterlogging by creating ponds is not straightforward and should be checked by a hydrological expert before adopting the idea. The plant species said by Kern *et al.* to be characteristic of Floodplain Wetland Complex are not all appropriate for this site, and Appendix C should be used in preference if wetland species are to be chosen for planting.

Monitoring

None of the pre-existing documentation or data examined in this study provides a basis for comparing present conditions with past conditions at this site.

The following items have been gathered to provide a baseline for future monitoring:

- The monitoring photographs displayed on pages 188-189, with locations and orientations shown on the aerial photograph on page 182. The photographs were taken on 21st February 2005. Original digital images are available separately. Repeat the photographs about every two years. Check tree foliage density, the abundance of weeds and structural changes in the vegetation.
- The flora list for the reserve, as provided beneath the heading 'Full flora list' above and stored in full detail in this study's flora database.
- Ratings of weed severity, as listed under the heading 'Threats' above.
- Tree health ratings, as tabulated above and stored in the geographic information system data from this study.

Information sources used in this assessment

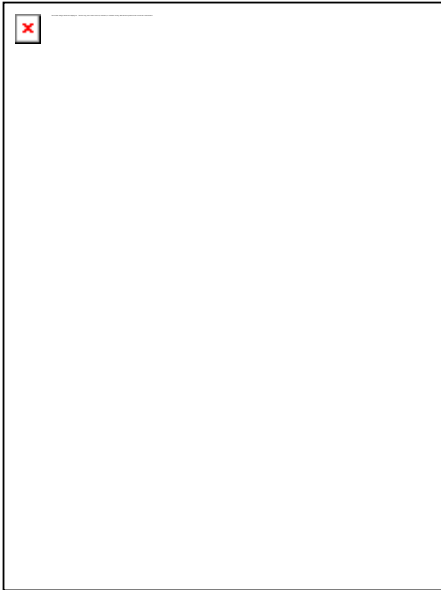
- A vegetation and habitat survey by Dr Lorimer for a total of two hours and twenty-five minutes on 21st January and 21st February 2005, using this study's standard approach described in Section 2.3. This included:
 - Compilation of a list of indigenous and introduced plant species, including the species' abundances and the threat level of all weed species;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Individual measurement and health assessment of large old trees;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- A brief report by Kern L., Gannon P. and Muir A. (2000). *Flora and Vegetation Mapping on Waterways in the City of Boroondara, Victoria: Fairview Park*. Practical Ecology Pty Ltd, Preston. i + 14 pp;
- Information from the Department of Sustainability & Environment's flora and fauna databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

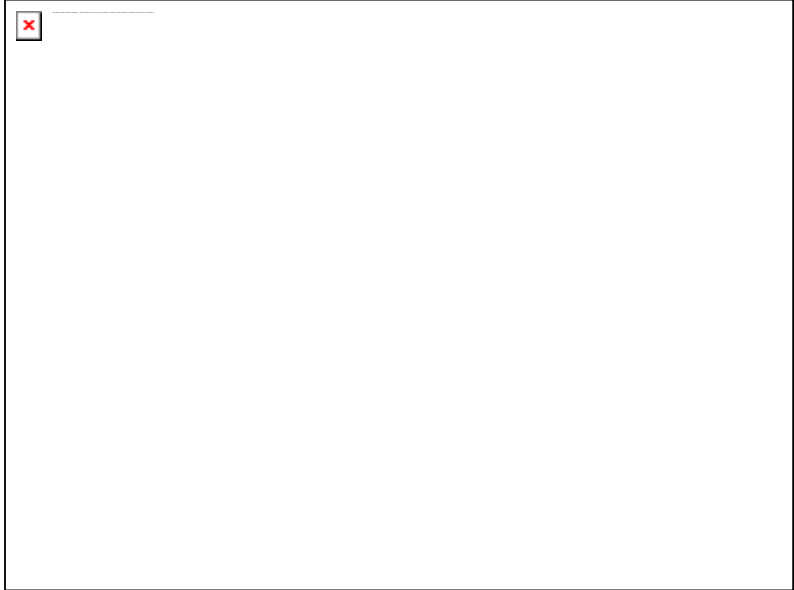
No additional biological investigation is recommended.

Monitoring photographs for the Fairview Park area, taken on 21st February, 2005

The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 182.



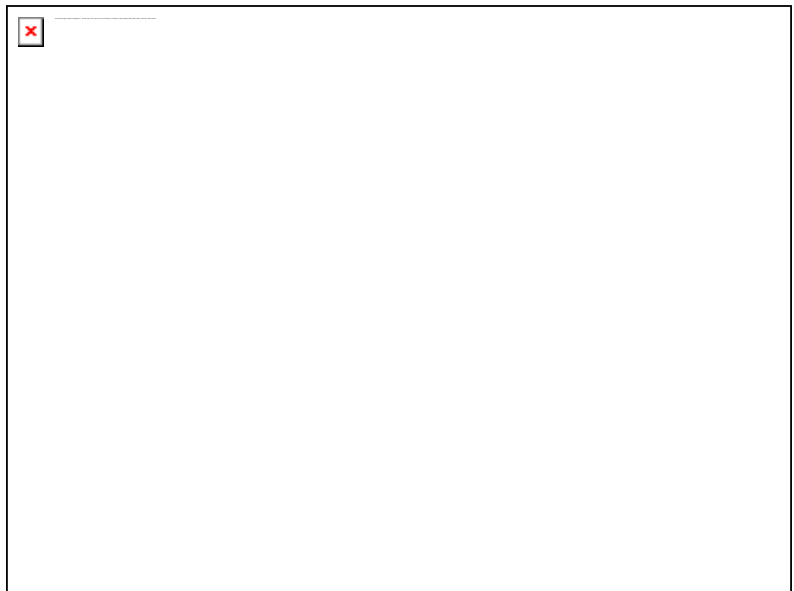
Site 16, Photo 1. Looking south at a River Red Gum at the entrance to the Leonda restaurant, to show the condition and structure of the tree.



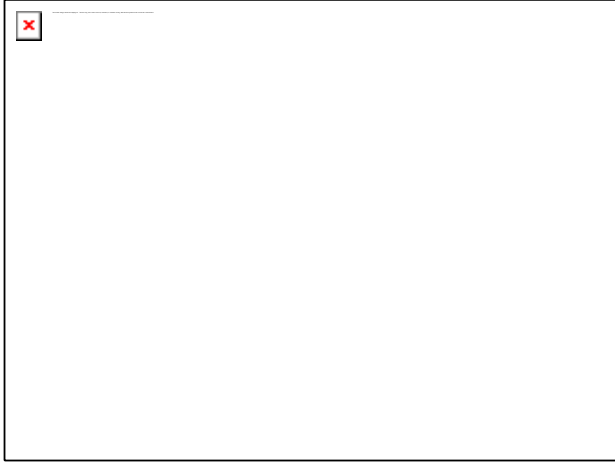
Site 16, Photo 2. A southward view of the tree numbered 1 on the aerial photograph of page 182, to show the condition and structure of the tree. The tree's health was recorded as very good, notwithstanding structural imperfection (which does not amount to ill health).



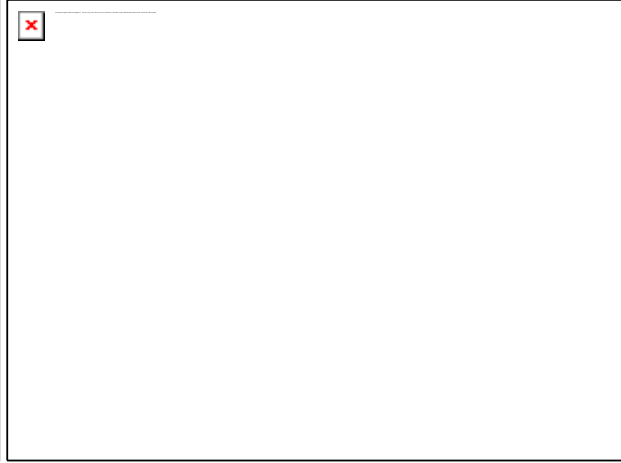
Site 16, Photo 3. Looking southeast from the southeastern corner of the Leonda restaurant, to show the condition of a cluster of three River Red Gums.



Site 16, Photo 4. A view of the young revegetation beside the Yarra River, with tree number 2 in the middle distance. Note the prolific mistletoe in tree number 2, whose health was nevertheless recorded as good.



Site 16, Photo 5. Trees numbered 3, 4 and 5, viewed from the southern end of the nearest cricket pitch, to show their foliage density. The trees' health was recorded as good, very good and good, respectively.



Site 16, Photo 6. A view of tree 5 from half way between it and the nearest cricket pitch, to show the density of the tree's foliage, the revegetation to its right and the oaks to its left.



Site 16, Photo 7. A view into the crown of tree 5 from its base, to show the crown's structure, foliage density and prevalence of mistletoe.

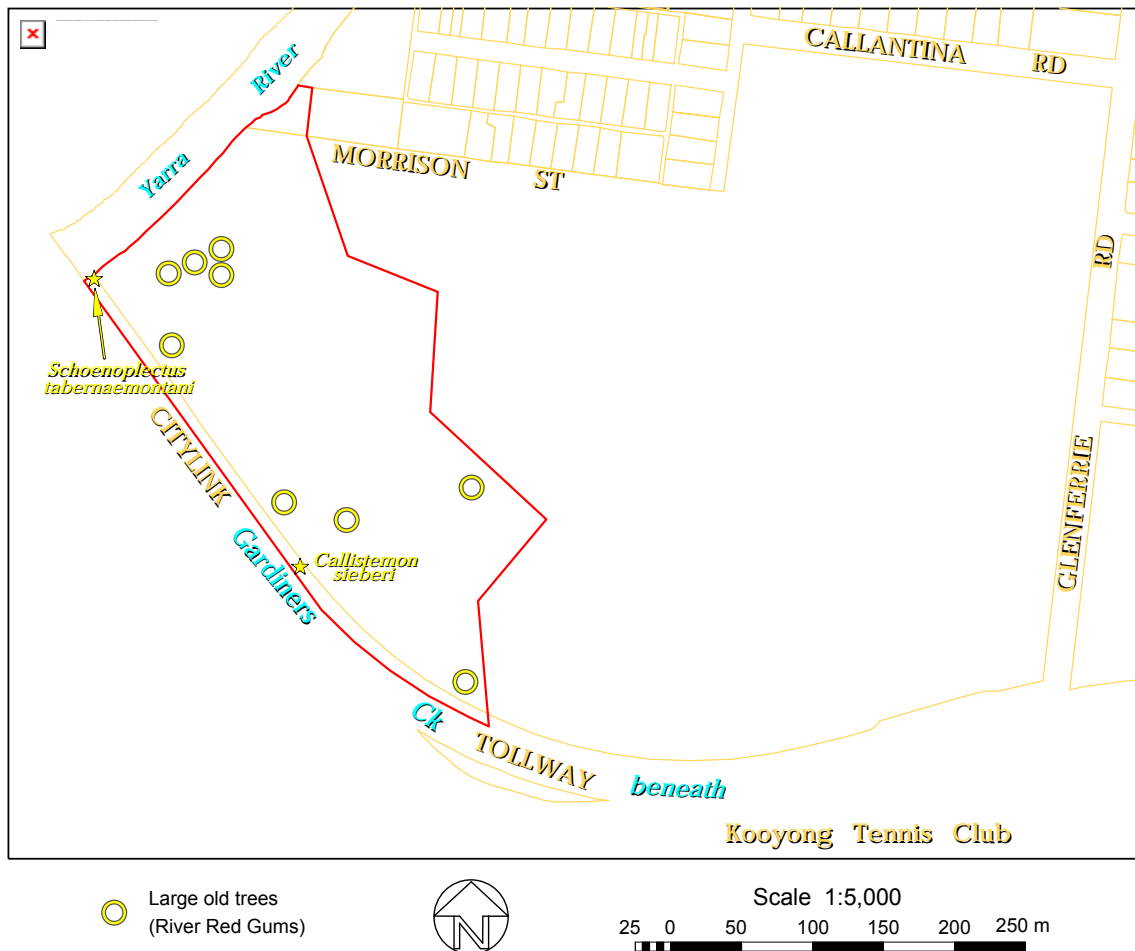
Site 17. Scotch College, Hawthorn

Riverbank and floodplain vegetation within the grounds of the college. Melway ref. 59 C2.

Site Biological Significance Level: *Local*

Summary of significant natural assets

- Approximately nine large River Red Gums, probably centuries old, that are remnants of the endangered Ecological Vegetation Class called Floodplain Riparian Woodland;
- There are single specimens of each of three locally threatened plant species;
- The combination of remnant River Red Gums and healthy, dense revegetation provides fauna habitat that assists the ecological function of the wildlife corridors along both Gardiners Creek and the Yarra River.



Boundaries

This site is outlined in red on the aerial photograph above. The edge of the Yarra River and Gardiners Creek form two sides of the site. The site boundary coincides with property boundaries north of Morrison St, and six straight-line segments have been drawn between the western end of Morrison St and the southeastern corner of the site.

Note

Permission was not granted to access this site. The assessment here has therefore been obtained from along the Yarra River, Gardiners Creek and the CityLink tollway. This precluded detailed inspections such as measurement of tree trunk diameters that would otherwise have been done. Biologically significant features may have gone undetected as a result.

Physical features

Site area: 6.2 hectares

Elevation: The normal water level for the Yarra River ~~and billabong~~ is at an elevation of 16-m. The highest elevation in the site is 5 m near the college's tennis courts~~of the roadway is approximately xx0 m.~~

Landform: Floodplain, riverbank and artificial flood levee.

Slope: The site is generally rather flat, typically with an elevation of 3 m and a gradient of 1:20. The main exceptions are the steeply sloping embankments at the edges of the streams, and a low flood levy beside Gardiners Creek.~~The floodplain is generally flat, but it slopes down sharply at the river and on the southern and eastern banks of the billabong. Within a distance of typically 20 m of the National Guide Dog Centre, the slope increases to a maximum gradient of 1:9.~~

Soil type: Alluvium.

Underlying geology: The bedrock is Silurian sedimentary rock of the Dargile formation, but is buried so deeply beneath alluvium that it does not influence the site's flora or fauna.

Site description

This site is on the floodplain at the confluence of the Yarra River and Gardiners Creek, the latter being invisible on the aerial photograph because the CityLink tollway is suspended above it. The banks of both streams have been heavily modified to stabilise them, but the locally threatened indigenous plant species, *Schoenoplectus tabernaemontani* and *Callistemon sieberi*, have established themselves in gaps between rock or paving at the water's edge.

There are nine River Red Gums (*Eucalyptus camaldulensis*) that appear from a distance to have trunk diameters exceeding 0.8 m, which would qualify them as 'large old trees' according to the Department of Sustainability & Environment's criteria. They are certainly well over a century old, and this is probably also true of several other River Red Gums in the grounds. The trees appear well maintained and some have nest boxes.

The flood levee beside Gardiners Creek and the CityLink tollway has some remnant eucalypts and indigenous plantings of various ages, growing well. The selection of species and the density of species in the revegetation meet the basic habitat needs of many native birds, including small insect-eaters such as White-browed Scrubwrens.

Ecological links with other land

The annual summer appearance of the Sacred Kingfisher at Nettleton Park Reserve (Site 21) can be best explained by migration along the Yarra River and Gardiners Creek via Scotch College. The combination of mature eucalypts and healthy revegetation can only encourage the Sacred Kingfisher to continue this migration in years to come. Other fauna species may well also conduct such movements through Scotch College. The main barrier to such movements is the fragmentation of the corridor of native vegetation upstream of the college.

Habitat type

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion). There is too little naturally occurring indigenous understorey at this site to be regarded as a remnant patch of this EVC, although revegetation compensates to some degree. Five naturally-occurring indigenous plant species were seen, as follows:

Canopy trees: A pure stand of *Eucalyptus camaldulensis*.

Lower trees: Only one small individual of *Acacia dealbata* could be seen among the remnant vegetation, but this species would once have been abundant.

Shrubs, vines, ferns: None were visible.

Ground flora: At the water's edge there is one patch of *Phragmites australis* beside the Yarra River, one young *Callistemon sieberi* beside Gardiners Creek, and a patch of *Schoenoplectus validus* beside a bridge pylon at the confluence of the two streams.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Notes
Melbourne	Boroondara		
Rare or threatened	Critically Endangered	<i>Schoenoplectus tabernaemontani</i>	One patch next to a bridge pylon.
	Endangered	<i>Callistemon sieberi</i>	One individual ½ m tall in a pavement gap on the edge of Gardiner's Creek.
	Vulnerable	<i>Phragmites australis</i>	One patch beside the Yarra River.

Large old trees

Nine River Red Gums (*Eucalyptus camaldulensis*) appear from a distance to have trunk diameters exceeding 0.8 m, which would qualify them as 'large old trees' according to the Department of Sustainability & Environment's criteria. Their health appeared good or very good, as best could be seen from outside the college or on aerial photographs. Hollows could not be seen.

Fauna of special significance

Conservation Status				Species Name	Last Record
National	Victoria	Melbourne	Boroondara		
Vulnerable	Vulnerable	Rare	Secure	Grey-headed Flying-fox	1989
			Endangered	Water Rat or Rakali	2004

Although the Grey-headed Flying-fox is a significant species, the record from Scotch College in 1989 is not significant because this species can be found in Melbourne backyards nightly.

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species.

Mammals		Dusky Moorhen	2001	White-plumed Honeyeater	2001
Common Brushtail Possum	1989	Masked Lapwing	2005	Magpie-lark	2001
Water Rat or Rakali	2004	Silver Gull	2001	Willie Wagtail	2001
Grey-headed Flying-fox	1989	*Rock Dove	2001	Australian Magpie	2005
		*Spotted Turtle-Dove	2001	Little Raven	2005
Birds		Rainbow Lorikeet	2001	*House Sparrow	2001
Australian Wood Duck	2005	Red-rumped Parrot	2005	Welcome Swallow	2005
Pacific Black Duck	2005	White-browed Scrubwren	2001	*Common Blackbird	2001
Little Pied Cormorant	2001	Red Wattlebird	2001	*Common Starling	2001
Little Black Cormorant	2001	Brush Wattlebird	2001	*Common Myna	2001
Intermediate Egret	2001	Bell Miner	2001		
		Noisy Miner	2005		

Site significance ratings

The following is an assessment of the site against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

The combination of the site's large old trees and the revegetation beside Gardiners Creek and the CityLink tollway qualify for **Local** significance under BioSites criterion 1.3 as a '*Cleared or degraded area which may with suitable habitat reconstruction or rehabilitation work form a strategically important corridor...of local importance and scale*'.

BioSites criterion 1.1.1 attributes local significance to 'All parts of riparian systems with riparian vegetation present'. The River Red Gums and revegetation in this site are scarcely sufficient to be deemed 'riparian vegetation', but this could change as the revegetation matures.

Rare or threatened plants

Although the site has three locally threatened plant species, there is only a single individual of each. Even when each one is considered as part of a larger, reproductively connected population along the Yarra, they probably do not qualify for Local significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

The recent detection of the locally endangered Water Rat (or Rakali) on the banks of Gardiners Creek beneath the freeway qualifies the site for Local significance according to BioSites criterion 3.1.5.

Large trees

The BioSites criteria do not recognise any biological significance of individual large trees, but this should not be taken to imply that the centuries-old trees in this site are not significant when considered against criteria related to heritage or aesthetics.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age. However, the latest version states, '*Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats*'. The last sentence is not correct in the present site or in Boroondara more generally.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

No specific threats could be seen to the college's indigenous flora or fauna.

Future revegetation

There are no indigenous bushes or small trees along the Yarra River at Scotch College. This creates a gap in the Yarra River ecological corridor. It would be ecologically desirable to plant some of the Yarra frontage with indigenous shrubs and small trees, similar to Fairview Park or the levee beside Gardiners Creek at Scotch College.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for approximately two hours on 7th July 2005, from as close to the site's perimeter as was possible. This included:
 - Compilation of a list of indigenous plant species, including their abundances;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site;
 - Mapping of individual large old trees;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Information from the Department of Sustainability & Environment's flora and fauna databases;
- The report by Quin D.G., Cook S. and McMahon J. (2004): '*Gardiners Creek Water Rat* *Hydromys chrysogaster Survey*'. Report from Ecology Australia to Melbourne Water. iv + 30 pp + data spreadsheet;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

The vegetation along the flood levee beside Gardiners Creek seems likely to serve as part of a corridor for movement of birds along Gardiners Creek. It may be educational, interesting and scientifically useful if someone in the college community could watch for birds in the vegetation and record the species and any significant movements (e.g. by Sacred Kingfisher, which seems likely to move through there twice annually).

Site 18. Yarra River

The largest river in the Melbourne area, with many values for humans and nature.

Site Biological Significance Level: *National*

Summary of significant natural assets

- The river supports a rich diversity of fish, including substantial populations of species that are threatened nationally or within the Yarra catchment;
- The river is an ecological corridor of regional importance. Among the fauna species that move along the river are nine native fish species that migrate between the river and the sea as a necessary part of their life cycles.

Boundaries

This site comprises the bed of the Yarra River and everything above it, for the full extent that it borders the municipality of Boroondara (i.e. from Koonung Creek to Gardiners Creek). It abuts each of Sites 4-17.

Physical features

Elevation: The normal water level of the Yarra River falls from an elevation of 6 m to 1 m as it flows along the edge of Boroondara, with approximately half of the drop being at Dight's Falls (Melway reference 2D B6).

Site description

In addition to its well-known benefits to humans, the Boroondara stretch of the Yarra River supports many rare or threatened fauna species and provides vital water, alluvium and flooding to the adjacent floodplains. The airspace above it is used as a flyway by waterbirds such as cormorants, who also take fish from the river.

The river is subject to pollution and flow modification. Melbourne Water (2004) rate the condition of the 'middle and lower Yarra River' (incorporating the Boroondara section) as follows:

- Water quality: Moderate;
- Aquatic life: Poor;
- Bed/bank stability: Moderate;
- Vegetation: Poor;
- Flow: Poor.

Melbourne Water is the organisation with greatest responsibility for the river's management, but other organisations have important roles in the river's care.

Ecological links with other land

The Boroondara section of the Yarra River is obviously just one section of a much larger aquatic ecosystem. A high proportion of Boroondara's native fish species must migrate upstream and downstream between the river and the sea to complete their life cycle. The fish ladder constructed at Dight's Falls in 1993 has significantly improved the capacity of fish to achieve this. Similarly, Platypus within Boroondara have to periodically move upstream beyond Boroondara to find mates or new feeding grounds.

The landform, fertility and plentiful subterranean water of the adjacent floodplains and riverbanks have resulted from, and are dependent upon, the waters of the Yarra River. Major floods also renew ecological cycles of adjacent native vegetation, particularly wetlands. The major floods during this project, particularly the event commencing 2nd February 2005, demonstrated the effectiveness of floods in destroying large areas of the very serious weed, Wandering Jew (*Tradescantia fluminensis*) on riverbanks and floodplains.

Habitat type: Perennial stream.

Flora

Submerged vegetation was not investigated in this study. Fringing vegetation is treated as part of other sites.

Fauna of special significance

The significant fauna species in the list below have been recorded in the Boroondara section of the Yarra River. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status				Species Name	Last Record
National	Victoria	Melbourne	Boroondara		
Endangered	Endangered	Introduced	Introduced	Macquarie Perch	1993
Vulnerable	Vulnerable	Endangered	Vulnerable	Australian Grayling	1993
Vulnerable	Near Threatened	not assessed	Extinct	Yarra Pigmy Perch (type locality)	1872
	Critically Endangered	Endangered	Endangered	Australian Mudfish (1 larva)	1991
	Endangered	Introduced	Introduced	Freshwater Catfish	2000
	Endangered	Introduced	Introduced	Murray Cod	2000
	Vulnerable	not assessed	Introduced	Golden Perch	1993
		Endangered	Vulnerable	Spotted Galaxias	1996
		Endangered	Vulnerable	Pouched Lamprey	1994
		Vulnerable	Vulnerable	Broadfin Galaxias	1995
		Vulnerable	Vulnerable	Flatheaded Gudgeon	1996
		Vulnerable	Vulnerable	Tupong	1996
		Vulnerable	Secure	Short-headed Lamprey	1996
		Near Threatened	Endangered	Platypus	2005
		Rare	Vulnerable	Black Bream	1991
		Rare	Vulnerable	Australian Smelt	1995
		Rare	Secure	Common Galaxias	1996
			Vulnerable	Common Long-necked Tortoise	2005

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species.

Mammals

Platypus 2005

Reptiles

Common Long-necked Tortoise 2005

Fish

Broadfin Galaxias	1995	*Roach	1996	*Freshwater Catfish	2000
Tasmanian Mudfish	1991	Flatheaded Gudgeon	1996	*Oriental Weatherloach	1996
Common Galaxias	1996	Pouched Lamprey	1994	*Mosquitofish	1995
Spotted Galaxias	1996	Short-headed Lamprey	1996	*Murray Cod	2000
Black Bream	1991	Shortfin Eel	1996	*Golden Perch	1993
Yarra Pigmy Perch	1872	*Rainbow Trout	1996	*Macquarie Perch	1993
*Yellowfin Goby	1996	*Brown Trout	1994	*Australian Bass	1991
*Goldfish	1996	Australian Smelt	1995	*Redfin	2000
*Carp	2004	Australian Grayling	1993	Tupong	1996

Site significance ratings

The following is an assessment of the site against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

The Australian Grayling is a fish that migrates between freshwater and the sea during its life cycle. It is listed as vulnerable under the federal *Environment Protection and Biodiversity Conservation Act 1999*. This species has been found in the Yarra River near Dight's Falls in substantial numbers (up to sixty at a time) during each fish survey for which data is available in the Atlas of Victorian Wildlife. According to BioSites criterion 1.2.2, a 'site regularly used by migratory taxon which is nationally threatened' is **Nationally** significant. However, this criterion draws no distinction between international migration or local-scale migration, so its correct application is somewhat obscure.

The Yarra River is an ecological corridor that is important at the regional or catchment scale. This gives the river **Regional** significance under BioSites criterion 1.2.6.

Richness and diversity

The Yarra River's fish fauna is unusually rich at the regional or catchment scale. This gives the river **Regional** significance under BioSites criterion 2.1.

Rare or threatened fauna

BioSites criterion 3.1.1 accords **National** significance to 'All sites for a taxon listed as critically endangered or endangered'. This includes the Yarra River in Boroondara due to the presence of a self-sustaining, introduced population of Macquarie Perch. This population is now larger than in any natural population, thereby making a major contribution to the species' security.

The river's population of Australian Grayling is of either National or State significance under BioSites criterion 3.1.1, depending on whether or not this section of the river is deemed an 'important site' for the species.

The Yarra River supports viable populations of many of the other fauna species listed beneath the heading 'Fauna of special significance' above. Each such population gives the river **Local** significance under BioSites criterion 3.1.5.

Information sources used in this assessment

- Information from the Department of Sustainability & Environment's flora and fauna databases;
- Additional observational records of Platypus, Carp and Common Long-necked Tortoise in 2004-5 by the author and Cam Beardsell;
- Discussion with Tarmo Raadik, a freshwater scientist at the Arthur Rylah Institute for Environmental Research;
- Information about Australian Grayling on the federal government's website for the *Environment Protection and Biodiversity Conservation Act 1999*; and
- Topographic data and maps produced by agencies of the Victorian government.

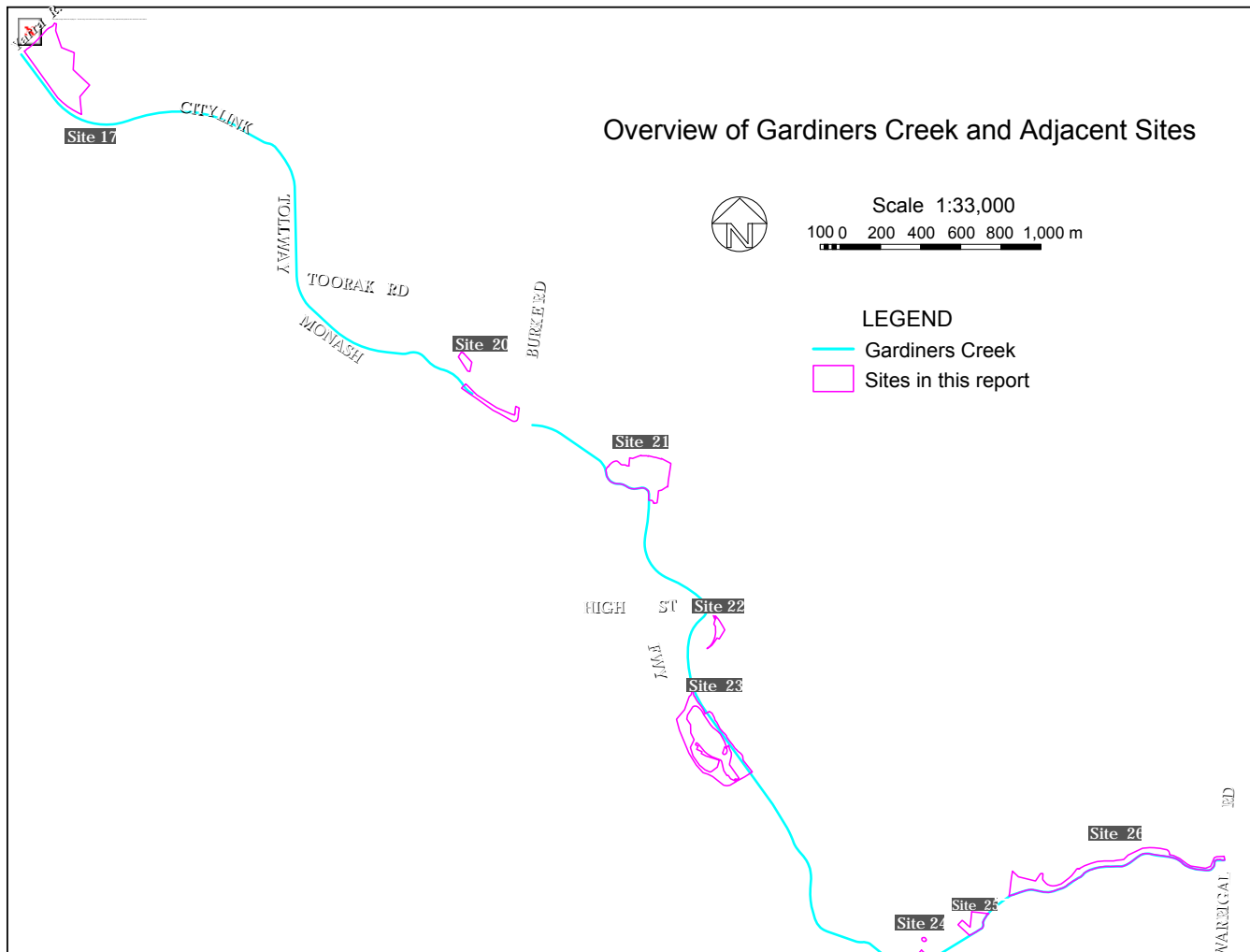
Site 19. Gardiners Creek Corridor

A heavily modified suburban stream, along with patches of riverbank native vegetation not included in other sites.

Site Biological Significance Level: *Local*

Summary of significant natural assets

- The creek supports at least four species of native fish and one species of plant that are all locally threatened;
- The creek is an ecological corridor of local importance. Among the fauna species that move along the river are three native fish species that migrate between the creek and the sea as a necessary part of their life cycles.



Boundaries

This site comprises:

- The waters and bed of Gardiners Creek within Boroondara (from Warrigal Rd to the Yarra River), extending to the brow of the creek channel; and
- Native vegetation on adjacent public land, except for land included in Sites 17 and 20-26.

A detailed boundary has not been drawn because this site is outside the project brief for this study.

Physical features

Elevation: The normal water level of Gardiners Creek falls from an elevation of 31 m to 1 m as it flows along the edge of Boroondara.

Underlying geology: Silurian sandstones and siltstones, exposed commonly where the creek flows through Ashburton.

Site description

Gardiners Creek supports at least four species of native fish, three of which migrate to and from the sea as a necessary part of their life cycle. It also supports indigenous Water Rats, yabbies and numerous invertebrate species.

These species, in turn, provide food for the stream's abundant waterbirds, such as ducks, cormorants and the White-faced Heron.

Unfortunately, Gardiners Creek is also badly infested with Carp, which can be easily seen at the surface on fine days. Carp are seriously disturbing the water and are predators of native fish.

The creek is also subject to pollution and flow modification by the highly urbanised land use in its catchment. Melbourne Water (2004) rate the condition of Gardiners Creek in general as follows:

- Water quality: Poor;
- Aquatic life: Poor;
- Bed/bank stability: Good;
- Vegetation: Very poor;
- Flow: Very poor.

Melbourne Water is the organisation with greatest responsibility for the river's management, but other organisations have important roles in the river's care.

The preceding discussion of indigenous fauna in the creek is based on very limited data. The brief study of fish and yabbies by Koster (2002) was the only study of the creek's vertebrates that the present author could find. This seems too low a level of investigation to support sound management of such a stream.

The creek's ecological function is dependent upon the fringing vegetation. The abundant exotic trees lining the creek, particularly deciduous ones, actively degrade the creek's ecology. Conversely, native vegetation (natural and planted) improve the ecology, through such mechanisms as temperature regulation and steady input of the right kinds of organic material.

The most important areas of native vegetation along the creek in Boroondara form Sites 17 and 20-26, as shown on the aerial photograph on the previous page. Other areas, such as immediately downstream of Site 20, were not included in the project brief for this study but are nevertheless included here as part of the present site so that they do not go unrecognised. Apart from some revegetation just west of Glenferrie Rd and some scattered plants at the water's edge, the areas of riverbank native vegetation were mapped by Kern *et al.**

Ecological links with other land

The Boroondara section of Gardiners Creek is just one section of a much larger aquatic ecosystem that extends into the Yarra River. Three of the four native fish species recorded in Gardiners Creek in recent years must migrate to and from the sea to complete their life cycle. At least one of these species – the Broadfin Galaxias – probably also needs to migrate well upstream of Boroondara during its lifecycle.

Waterbirds such as Chestnut Teal and White-faced Heron can be seen daily migrating along the Gardiners Creek corridor. The annual summer presence of the Sacred Kingfisher at Nettleton Park suggests that this species uses the Gardiners Creek corridor for its annual migration. Other birds, and probably flying insects, probably also migrate along the corridor. Most or all of these species are likely to rely on habitat outside the Gardiners Creek corridor.

The quality and flow characteristics of the creek are highly dependent upon stormwater and drainage in the catchment generally, and hence on the highly urbanised land use.

Habitat types

Perennial Stream (No EVC number).

Floodplain Riparian Woodland (EVC 56, endangered in the Gippsland Plain bioregion) – vestiges plus revegetation.

Flora

This site was not systematically surveyed for its flora because it was outside the project brief. Nevertheless, the author noticed indigenous plants scattered periodically along the creek at the water's edge, particularly various species of *Isolepis*, *Juncus* and *Persicaria*. Within the creek itself there are also substantial numbers of the species *Potamogeton crispus*,

* Kern L., Gannon P. and Muir A. (2000). 'Flora and Vegetation Mapping on Waterways in the City of Boroondara, Victoria: Gardiners Creek'. Practical Ecology Pty Ltd, Preston. 43 + ii pp.

which is endangered in Boroondara and uncommon in the whole Melbourne area. It was also clear that a considerable effort has been put into revegetating the riverbank between the sites outlined in magenta on the aerial photograph.

Fauna of special significance

The significant fauna species in the list below have been observed in or beside Gardiners Creek. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
Vulnerable	Rare	Occasional Visitor	Hardhead (seen once only)	2001
	Vulnerable	Extinct	River Blackfish	1950
	Vulnerable	Vulnerable	Broadfin Galaxias	2002
	Vulnerable	Vulnerable	Flatheaded Gudgeon	2002
	Vulnerable	Vulnerable	Crested Pigeon	2000
	Near Threatened	Endangered	Platypus	1948
	Near Threatened	Occasional Visitor	Peregrine Falcon	2001
	Rare	Secure	Common Galaxias	2002
		Endangered	Water Rat or Rakali	2004
		Endangered	Spotted Pardalote	2001
		Vulnerable	Little Pied Cormorant	1999
		Vulnerable	Little Black Cormorant	2001
		Vulnerable	White-faced Heron	1999
		Vulnerable	Eastern Rosella	2001
		Vulnerable	Laughing Kookaburra	2001
		Vulnerable	Superb Fairy-wren	2001
		Vulnerable	White-browed Scrubwren	2001
		Vulnerable	Grey Shrike-thrush	2001
		Vulnerable	Black-faced Cuckoo-shrike	2001
		Occasional Visitor	Scaly-breasted Lorikeet	2000

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Fish		Birds		Birds (continued)	
Broadfin Galaxias	2002	†Pacific Black Duck	2004	Laughing Kookaburra	2001
Common Galaxias	2002	†Chestnut Teal	2004	Spotted Pardalote	2001
*Yellowfin Goby	2002	Hardhead	2001	Brush Wattlebird	2000
*Goldfish	2002	Little Pied Cormorant	1999	Noisy Miner	2000
*Carp	2005	Little Black Cormorant	2001	†Magpie-lark	2001
Flatheaded Gudgeon	2002	White-faced Heron	1999	†Willie Wagtail	2001
Shortfin Eel	2002	Dusky Moorhen	2004	Black-faced Cuckoo-shrike	2001
*Brown Trout	1950	Eurasian Coot	2001	Grey Butcherbird	2000
*Oriental Weatherloach	2002	Silver Gull	2000	Australian Magpie	2001
*Mosquitofish	2002	*Spotted Turtle-Dove	2001	Little Raven	2000
River Blackfish	1950	Crested Pigeon	2000	Welcome Swallow	2004
		Sulphur-crested Cockatoo	2000	Silvereye	1999
Mammals		Rainbow Lorikeet	2000	*Common Blackbird	2001
Platypus	1948	Scaly-breasted Lorikeet	2000	*Common Starling	2001
Water Rat or Rakali	2004	Eastern Rosella	2000	*Common Myna	2001

Site significance ratings

The following is an assessment of the site against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

The Broadfin Galaxias, Common Galaxias and Shortfin Eel are fishes that migrate between Gardiners Creek and the sea. In the case of the Shortfin Eel, the migration goes as far as the Coral Sea. BioSites criterion 1.2.2 attributes Local or Regional significance to any site that is regularly used by a migratory species that is in decline or that represents more than a

prescribed proportion of the local or regional population of those species. Unfortunately, there is insufficient data to determine whether the migratory fish species are in local decline or reach the numbers required to qualify as significant under BioSites criterion 1.2.2. However, the precautionary principle would lead us to treat these species as representing at least **Local** significance.

Gardiners Creek is an ecological corridor that is important at the local scale. This gives the creek **Local** significance under BioSites criterion 1.2.6.

Rare or threatened flora

Gardiners Creek supports a viable population of *Potamogeton crispus*, which is endangered in Boroondara. This qualifies for **Local** significance under BioSites criterion 3.1.5.

Rare or threatened fauna

Gardiners Creek supports viable populations of the following fauna species that are threatened in Boroondara: Water Rat (or Rakali), Broadfin Galaxias, Common Galaxias and Flatheaded Gudgeon. Each such population gives the creek **Local** significance under BioSites criterion 3.1.5. The parts of the creek corridor represented in this site are also likely to be critical for the existence of the additional locally threatened species, Little Pied Cormorant, Little Black Cormorant and White-faced Heron, which also represents **Local** significance under criterion 3.1.5.

Information sources used in this assessment

- Incidental observations of flora and fauna by the author while walking along Gardiners Creek between Sites 17 and 20-26 between October 2004 and March 2005;
- Reports:
 - Koster W. (2002). *'An Assessment of the Aquatic Fauna in Gardiners, Scotchmans, Back and Damper Creeks'*. Report to Melbourne Water by the Freshwater Ecology Section, Department of Natural Resources and Environment, Melbourne. iv + 49 pp.;
 - Melbourne Water (2004). *'Melbourne's Rivers and Creeks 2004'*. Melbourne Water : Melbourne. 30 + i pp.;
 - Quin D.G., Cook S. and McMahon J. (2004). *'Gardiners Creek Water Rat Hydromys chrysogaster Survey'*. Report from Ecology Australia to Melbourne Water. iv + 30 pp + data spreadsheet;
 - Kern L., Gannon P. and Muir A. (2000b). *'Flora and Vegetation Mapping on Waterways in the City of Boroondara, Victoria: Gardiners Creek'*. Report from Practical Ecology Pty Ltd to the City of Boroondara. 42 + ii pages. Note that this report draws no distinction between planted and natural indigenous plants, and there are errors in the species list. Some of the data claimed to have been collected by the authors of the report in 2000 were actually collected (sometimes erroneously) by Ecology Australia (1995);
- Information from the Department of Sustainability & Environment's flora and fauna databases;
- Discussion with Tarmo Raadik, a freshwater scientist at the Arthur Rylah Institute for Environmental Research;
- Topographic data and maps produced by agencies of the Victorian government.

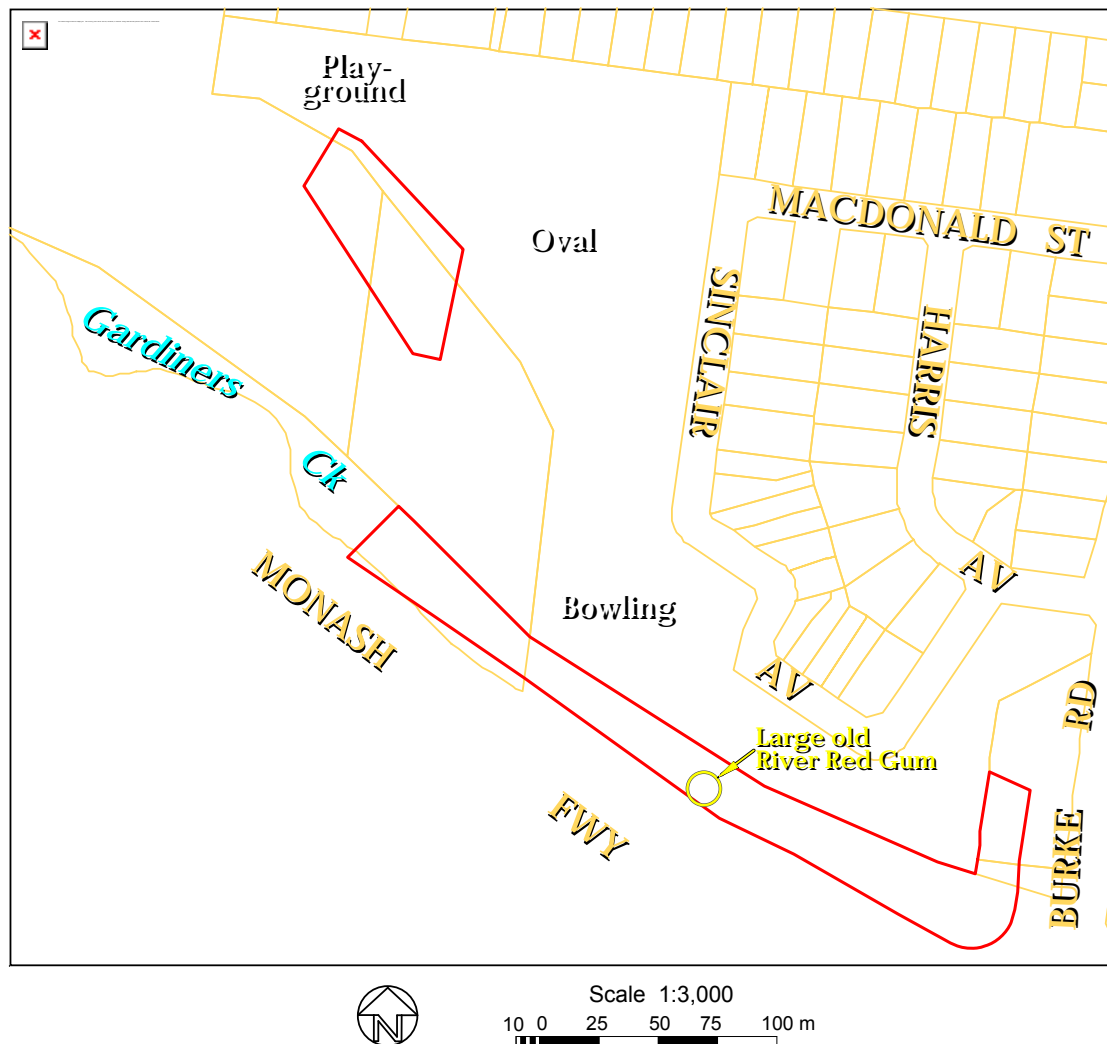
Site 20. Burke Road South Reserve, Glen Iris

Remnant vegetation, revegetation and Sugar Gums beside the Monash Fwy and beside an oval. Melway ref. 59 G5.

Site Biological Significance Level: *Local*

Summary of significant natural assets

- The combination of large eucalypts and healthy revegetation represent a node on the Gardiners Creek ecological corridor;
- There is a viable population of one (or probably two) plant species threatened in Boroondara;
- There is one large old River Red Gum in poor health, as well as many large, healthy Sugar Gums from South Australia that serve as surrogates for indigenous eucalypts.



Boundaries

The site is in two parts, outlined in red on the aerial photograph. The northwestern polygon includes a windbreak of Sugar Gums and a drainway beside the Burke Road South Reserve oval, extending from the bowling green to the playground northwest of the oval. The boundaries of the southern polygon comprise the following:

- The edge of the road formation of the Monash Freeway and Burke Rd;
- A straight line along the alignment of the outlet of Gardiners Creek drain at the site's northwestern end;
- A straight line along the edge of a revegetation plot at the northern end beside Burke Rd; and
- Property boundaries elsewhere, mostly close to the alignment of a shared pathway beside the freeway.

Land use & tenure

Public land. The northern polygon receives little use or attention from humans. The southern polygon has a purpose and use similar to a road verge. It includes a well-used shared pathway for cyclists and walkers.

Physical features

Site area: The northern polygon measures 0.316 hectares and the other polygon measures 0.780 hectares.

Elevation: 7-13 m, mostly close to 11 m.

Landform: Formerly a floodplain, but now the creek has been piped underground and roads have been built well above the plain.

Slope: Generally flat except for steep embankments beside Burke Rd and the Monash Freeway, which are both elevated well above the natural ground level.

Soil type: The native soil is alluvium. The content of the soil in the embankment of Burke Rd and the Monash Freeway is unknown.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek Formation, but it is buried too deep below the alluvium to directly influence the site's flora or fauna. Bedrock is exposed in the creek a short distance downstream.

Site description

Both of the polygons that make up this site contain large Sugar Gums (*Eucalyptus cladocalyx*) from South Australia, which may have been planted as windbreaks. In other respects, the two polygons are substantially different.

The northwestern polygon includes a drainway beside the oval. Where the ground has been scraped to create the drain (visible by the paler colour on the aerial photograph), substantial numbers of low indigenous plants grow, including *Atriplex semibaccata*, *Austrodanthonia bipartita/fulva*, *Austrodanthonia racemosa*, *Austrodanthonia setacea*, *Crassula sieberiana* s.l., *Einadia nutans* and *Oxalis perennans/exilis*. Directly beneath the Sugar Gums are scatterings of the same species, as well as *Austrodanthonia pilosa*.

These indigenous species probably owe their survival at this location to the effects of the Sugar Gums on nutrients and moisture in the soil; otherwise weeds such as Panic Veldt-grass (*Ehrharta erecta*) would have taken over. It is not uncommon in lowland Victoria to find native ground flora surviving in biological islands beneath Sugar Gums. The combined effects of the Sugar Gums and artificial drainage have made the soil beside the oval drier than natural. As a result, the indigenous plant species there belong to Plains Grassy Woodland from the adjacent slope rather than the Floodplain Riparian Woodland that would have preceded settlement. The Sugar Gums also have hollows, one of which was occupied by nesting Galahs when inspected by the author.

Sugar Gums play a more duplicitous role in the site's southern polygon. They provide nest sites, forage and other habitat needs for some indigenous birds, possums and insects, but they are also out-competing the six remnant River Red Gums (*Eucalyptus camaldulensis*) growing among them. The River Red Gums have trunk diameters of up to 0.8 m and two of them are probably more than a century old. They are suffering serious dieback due to scale insects and other unidentified causes, probably exacerbated by having the freeway built over part of their root systems. By comparison, the Sugar Gums have trunk diameters to 1.4 m and are in better health.

Among these trees are small numbers of planted non-indigenous eucalypts such as *Eucalyptus botryoides*. A young Swamp Gum (*Eucalyptus ovata*) on the north side of the path could be planted or natural.

Almost the entire southern polygon has been mulched and planted as indigenous revegetation, much of it beneath the Sugar Gums. The revegetation is healthy and well maintained, but there are some very persistent weeds. The most damaging weed at the time the author inspected the site (22/12/04) was Panic Veldt-grass (*Ehrharta erecta*), but Chilean Needle-grass (*Nassella neesiana*) and Pampas Lily-of-the-valley (*Salpichroa origanifolia*) pose similar threats.

Ecological links with other land

This site's two polygons represent nodes on the fragmented wildlife corridor along Gardiners Creek. The adjacent freeway and Burke Rd represent hazards for birds, possums and insects attracted to the site from elsewhere.

Habitat types

The site would have been covered with Floodplain Riparian Woodland (EVC 56) prior to settlement, but it is no longer recognisable. The native understorey in the northwestern polygon is much more indicative of Plains Grassy Woodland (EVC 55). The revegetation in the southern polygon combines species of Floodplain Riparian Woodland and Creekline Grassy Woodland (EVC 68), the latter of which is more appropriate under the circumstances of the artificial topography and drainage.

Habitat Score

Examples of habitat scoring (p. 13) for revegetation do not appear to have been published previously, despite the importance that such scoring will have in coming years for monitoring achievement of the state and federal government's 'Net Gain' policies. To provide a fairly typical example for revegetation that is several years old, habitat scoring was conducted for the revegetation between the shared pathway and the freeway, where there are some mature River Red Gums and Sugar Gums. The benchmark chosen was for Creekline Grassy Woodland (EVC 68), to suit the artificial landscape.

The calculated habitat score was 18% if the Sugar Gums are ignored or 29% if they are included. It seems more appropriate to put weight on the latter, since the Sugar Gums are acting as quite effective surrogates for the original River Red Gums, including the presence of hollows suitable for nesting.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (i.e. vulnerable and endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Notes
Endangered	<i>Atriplex semibaccata</i>	Fifteen plants beside the oval.
Vulnerable	<i>Austrodanthonia pilosa</i>	Three plants beneath trees near the oval.

Full flora list

In the following table, the columns headed, 'Northwest' and 'south' represent the two polygons that make up this site. Within these columns, 'D' indicates a dominant species; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. For weed species, 's' indicates serious threat, 'm' indicates moderate threat and 'n' indicates no significant threat.

Species Name	Northwest	South	Species Name	Northwest	South	Species Name	Northwest	South
Indigenous species (not planted)			<i>Eucalyptus camaldulensis</i>		✓	<i>Cytisus scoparius</i>		m
<i>Atriplex semibaccata</i>	✓		<i>Ficinia nodosa</i>		✓	<i>Ehrharta erecta</i>	s	s
<i>Austrodanthonia bipartita</i> s.l.	✓		<i>Goodenia ovata</i>		✓	<i>Ehrharta longiflora</i>	m	
<i>Austrodanthonia pilosa</i>	✓		<i>Hardenbergia violacea</i>		✓	<i>Fraxinus angustifolia</i>		m
<i>Austrodanthonia racemosa</i>	M		<i>Kunzea ericoides</i> spp. agg.		✓	<i>Galenia pubescens</i>	m	
<i>Austrodanthonia setacea</i>	M		<i>Lomandra longifolia</i>		✓	<i>Galium aparine</i>		m
<i>Crassula sieberiana</i> s.l.	✓		<i>Melaleuca ericifolia</i>		✓	<i>Genista monspessulana</i>	m	m
<i>Einadia nutans</i>	D		<i>Melicytus dentatus</i>		✓	<i>Hakea salicifolia</i>		n
<i>Eucalyptus camaldulensis</i>		D	<i>Poa labillardierei</i>		✓	<i>Ipomoea indica</i>		m
<i>Eucalyptus ovata</i> (planted?)		-	<i>Pomaderris racemosa</i>		✓	<i>Lactuca serriola</i>		n
<i>Juncus bufonius</i>		✓	Other planted species			<i>Lepidium africanum</i>	m	
<i>Muellerina eucalyptoides</i>		-	<i>Eucalyptus cladocalyx</i>	D	D	<i>Nassella neesiana</i>	m	s
<i>Oxalis exilis/perennans</i>	-		<i>Eucalyptus polyanthemus</i>		-	<i>Nassella trichotoma</i>		n
<i>Portulaca oleracea</i>	M		Weed species			<i>Pennisetum clandestinum</i>	m	
Planted indigenous species			<i>Acacia baileyana</i>		m	<i>Piptatherum miliaceum</i>	m	
<i>Acacia implexa</i>		✓	<i>Acacia floribunda</i>		n	<i>Pitiosporum undulatum</i>		m
<i>Acacia mearnsii</i>		✓	<i>Acacia saligna</i>		n	<i>Plantago lanceolata</i>	m	
<i>Acacia melanoxylon</i>		✓	<i>Avena</i> sp.	m	m	<i>Polycarpon tetraphyllum</i>	m	
<i>Bursaria spinosa</i>		✓	<i>Brassica fruticulosa</i>	m	m	<i>Salpichroa origanifolia</i>		s
<i>Callistemon sieberi</i>		✓	<i>Bromus catharticus</i>	m	m	<i>Sollya heterophylla</i>		m
<i>Carex inversa</i>		✓	<i>Chrysanthemoides monilifera</i>		m	<i>Sonchus oleraceus</i>		n
<i>Carex tereticaulis</i>		✓	<i>subsp. monilifera</i>			<i>Vicia sativa</i>		m
<i>Dodonaea viscosa</i>		✓	<i>Cotoneaster glaucophyllus</i>		m	<i>Vulpia myuros</i>		m

Large old trees

The site's largest River Red Gum (*Eucalyptus camaldulensis*) is depicted in Photograph 2 on page 206, and its location is marked on the aerial photograph on page 201. With a trunk diameter of 0.8 m, the tree just meets the Department of Sustainability & Environment's criterion for a 'large old tree' in EVCs dominated by River Red Gums. The tree is in poor health and no hollows were observed.

There are at least seven Sugar Gums (*Eucalyptus cladocalyx*) in the same area that exceed 0.8 m in trunk diameter. There are probably also some in the site's northwestern polygon, but they were not measured.

Fauna of special significance

The significant fauna species in the list below have been observed at or very near to Burke Road South Reserve. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18). An obelisk (†) preceding the name of a species indicates that breeding was confirmed.

Conservation Status		Species Name	Last Record	Notes
Melbourne	Boroondara			
Vulnerable	Vulnerable	Crested Pigeon	2004	Locally common on expanses of grass.
Near Threatened	Occasional Visitor	Peregrine Falcon	2000	Nearby pylons serve as perching sites.
	Vulnerable	Superb Fairy-wren	1960	May return in response to revegetation.
	Occasional Visitor	Rufous Fantail	1960	Unlikely to return.

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species. Breeding was confirmed for Galah only.

Butterflies		Birds			
*Cabbage White	2004	Pacific Black Duck	2004	White-plumed Honeyeater	2004
Common Grass-blue	2004	Peregrine Falcon	2000	Magpie-lark	2004
		Silver Gull	2004	Rufous Fantail	1960
		Crested Pigeon	2004	Australian Magpie	2004
Mammals		Galah	2004	*European Goldfinch	1960
Common Ringtail Possum	2004	Rainbow Lorikeet	2004	Silvereye	1960
		Superb Fairy-wren	1960	*Common Blackbird	2004
		Brush Wattlebird	2004	*Common Starling	1960
		Noisy Miner	2004	*Common Myna	2004

Note also that Quin *et al.* (2004) found tracks of the locally endangered Water Rat (or Rakali) at locations between 20 and 150 metres downstream of this site. This species probably makes little or no use of habitat within the site itself, since the creek was replaced by an underground pipe.

Site significance ratings

The following is an assessment of the site against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

The combination of the site's large trees and the revegetation beside the Monash Freeway qualify for **Local** significance under BioSites criterion 1.3 as a 'Cleared or degraded area which may with suitable habitat reconstruction or rehabilitation work form a strategically important corridor...of local importance and scale'.

Rare or threatened plants

The population of *Atriplex semibaccata* beside the oval appears to be viable. The adjacent population of *Austrodanthonia pilosa* may also be viable. Both species are locally threatened. A site with any viable population of a locally threatened species is of **Local** significance according to BioSites criterion 3.1.5.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Panic Veldt-grass (<i>Ehrharta erecta</i>), Chilean Spear-grass (<i>Nassella neesiana</i>), Pampas Lily-of-the-Valley (<i>Salpichroa organifolia</i>); • Moderately serious: Cootamundra Wattle (<i>Acacia baileyana</i>), Oat (<i>Avena</i> sp.), Twiggy Turnip (<i>Brassica fruticulosa</i>), Prairie Grass (<i>Bromus catharticus</i>), Boneseed (<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>), Cotoneaster (<i>Cotoneaster glaucophyllus</i>), English Broom (<i>Cytisus scoparius</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Sugar Gum (<i>Eucalyptus cladocalyx</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Galenia (<i>Galenia pubescens</i> var. <i>pubescens</i>), Cleavers (<i>Galium aparine</i>), Montpellier Broom (<i>Genista monspessulana</i>), Lear’s Morning-glory (<i>Ipomoea indica</i>), Common Pepper-cress (<i>Lepidium africanum</i>), Perennial Rye-grass (<i>Lolium perenne</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Rice Millet (<i>Piptatherum miliaceum</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Ribwort (<i>Plantago lanceolata</i>), Four-leafed Allseed (<i>Polycarpon tetraphyllum</i>), Bluebell Creeper (<i>Sollya heterophylla</i>), Common Vetch (<i>Vicia sativa</i>), Rat’s-tail Fescue (<i>Vulpia myuros</i>). 	All	Moderate	Current
Eucalypt dieback disease due to scale insects or other causes.	Trees; Eucalypt-dependent fauna; Wildlife corridor	Moderate	Current
Road kill of native fauna	Fauna	Low	Current

Past management and revegetation

The site’s northwestern polygon shows no sign of having been managed for nature conservation. Rubbish has been dumped within it.

The southern polygon has been well revegetated and shows signs of regular (but incomplete) weed control.

Priority actions

1. Spray the Chilean Needle-grass (*Stipa neesiana*) in the revegetation area near the bowling pavilion, in November. Follow up in following Novembers until the species is confidently eradicated. The importance is moderate and the urgency is high.
2. Remove all shrub weeds listed as ‘moderately serious’ above. ‘Cut-and-paint’ method would be appropriate in most or all cases. The importance and urgency are both moderate.
3. Seek arboricultural advice about improving the health of the unhealthy eucalypts and the hazard presented by the trees. People are probably more likely to be at risk from falling limbs next to the oval rather than near the freeway.

Future revegetation

The native vegetation beneath the Sugar Gums in the site’s northwestern polygon would benefit more from weed control than revegetation. However, if the weeds are controlled, then drought-tolerant indigenous shrubs of Plains Grassy Woodland could be introduced. Suitable species include *Acacia acinacea*, *Acacia paradoxa*, *Acacia pycnantha* and *Bursaria spinosa*.

Any additional planting in the southern polygon would be better selected from the species of Creekline Grassy Woodland rather than Floodplain Riparian Woodland. Riverine species such as *Callistemon sieberi* and *Melicytus dentatus*, and wetland species from the basalt plains such as *Carex tereticaulis*, would be best avoided in future.

Records should be kept of any planting done in this (or any other) site, including species, numbers and locations.

Monitoring

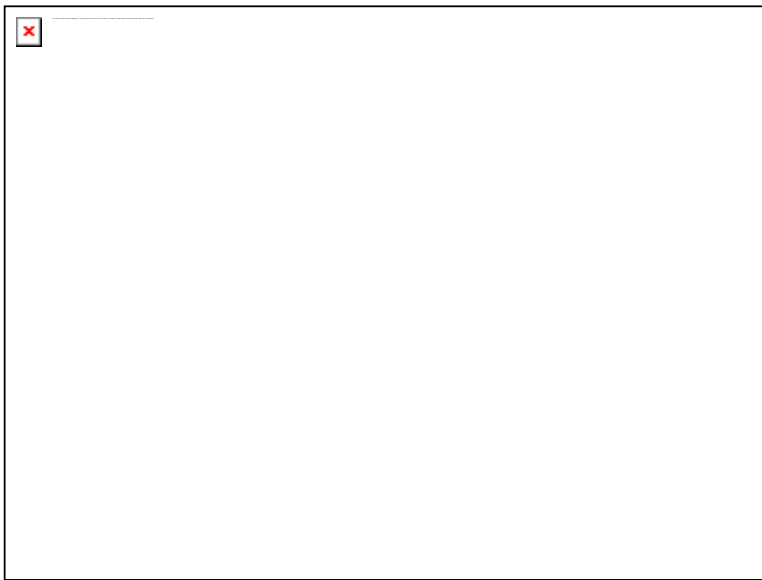
Kern *et al.* (2000) tabulated quadrat data for this site’s southern polygon. Their data are quite similar to those in the table above, beneath the heading ‘Full flora list’. The differences can be attributed to the different seasons of the surveys (June versus December) and some minor oversights or misidentifications. The data therefore does not show any significant

change in the vegetation in the intervening 4½ years, although the plants have obviously grown. Both sets of data will be useful for future monitoring, and should be revisited every two to four years (preferably around December).

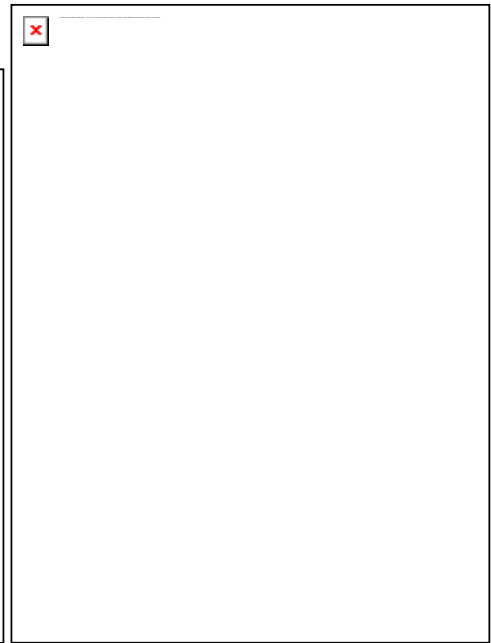
The following items have been gathered to provide additional data for future monitoring:

- The two photographs below, taken on 22nd December 2004. Original digital images are available separately. Repeat the photographs about every two years. Check tree foliage density and structural changes in the vegetation.
- The flora lists for each of the site's two polygons, as provided beneath the heading 'Full flora list' above.
- Population sizes of scarce plant species, as indicated beneath the heading 'Flora of special significance' above.
- The habitat score determination for the southern polygon. The original field data sheets are available separately. Repeat every two to four years. Check the abundance of weeds, structural changes in vegetation, changes in habitat score and the species present.

Monitoring photographs for the Burke Road South Reserve, taken on 22nd December 2004



Site 20, Photo 1. Eastward view from beside a large stump on the northern side of the path near the bowling club car park. The tree on the left of the path is a *Eucalyptus camaldulensis*, possibly indigenous. The purpose of the photograph is to show the trees' overall condition, the density of their foliage and the structure of the vegetation overall.



Site 20, Photo 2. The crown of the River Red Gum next to the Sinclair Avenue car park (marked on the aerial photograph), as seen from the base of a large Sugar Gum located c. 5m to the northwest.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for three hours and twenty-five minutes on 22nd December 2004, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species in each part of the site and for a short distance further downstream, including the indigenous species' abundances and the threat level of all weed species in each area;
 - Mapping, counting and recording populations of plant species that are rare or threatened in the site or more generally;
 - Assessment of habitat score;
 - Individual measurement and assessment of all River Red Gums and many Sugar Gums;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Spotlighting for thirty minutes on the night of 21st October 2004;
- Reports:
 - Quin D.G., Cook S. and McMahon J. (2004). '*Gardiners Creek Water Rat Hydromys chrysogaster Survey*'. Report from Ecology Australia to Melbourne Water. iv + 30 pp + data spreadsheet;

- Kern L., Gannon P. and Muir A. (2000). '*Flora and Vegetation Mapping on Waterways in the City of Boroondara, Victoria: Gardiners Creek*'. Note that the report draws no distinction between planted and natural indigenous plants;
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases;
- The Department of Sustainability & Environment's BioMaps of the area;
- Aerial photography from August 2004;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

No further investigation is recommended here, other than the monitoring proposed above.

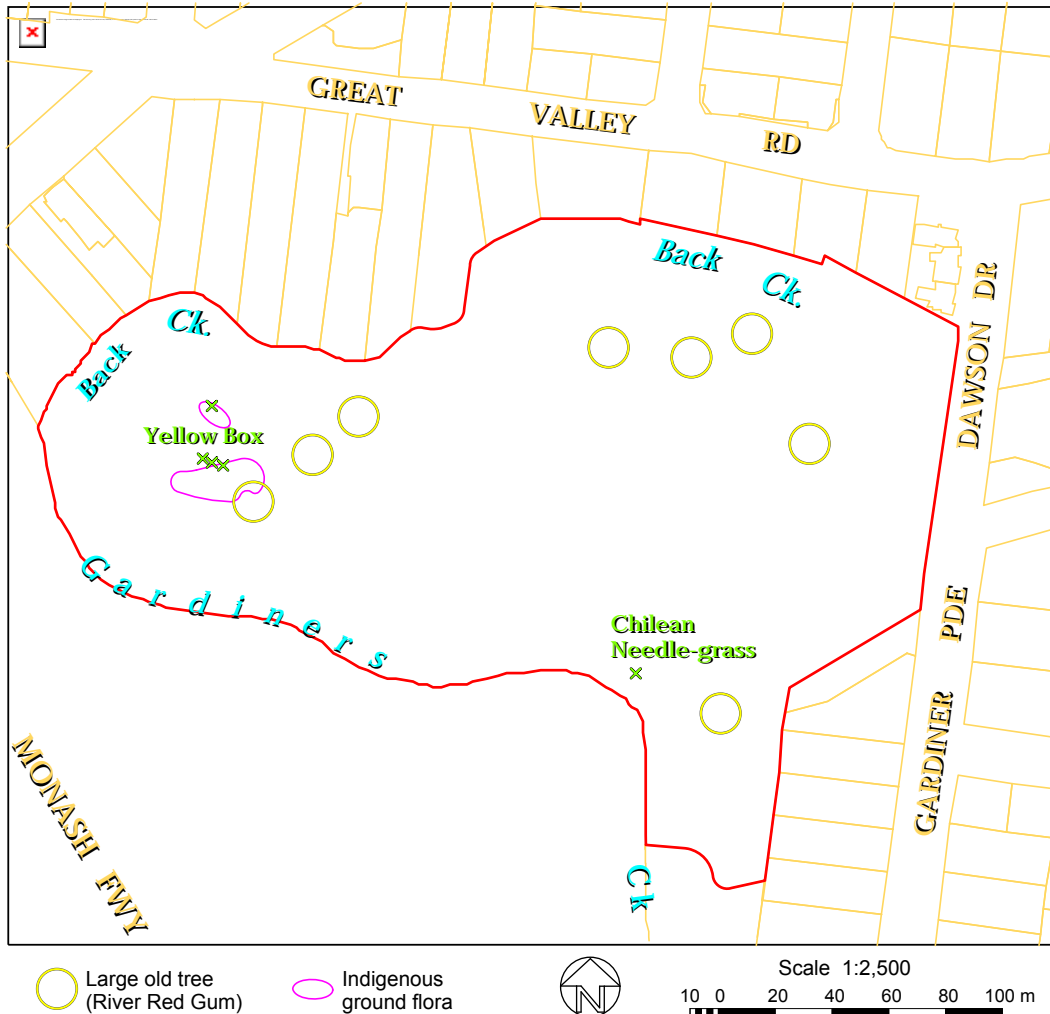
Site 21. Nettleton Park Reserve, Glen Iris

Recreation reserve between Gardiners Ck and Back Ck, with remnant vegetation and revegetation. Melway ref. 59 J7.

Site Biological Significance Level: *Local*

Summary of significant natural assets:

- Unusually rich native bird life for an urban area, some of which migrate long distances to the reserve each year;
- Viable populations of four plant species and approximately ten bird species that are threatened in Boroondara;
- Eight large old River Red Gums;
- The site is at the junction between wildlife corridors along Gardiners Creek and Back Creek.



Boundaries

The site is outlined in red on the aerial photograph. The boundary coincides with the property boundary of Nettleton Park Reserve except that the southern limit follows a footbridge, footpath and the southern edge of a revegetation plot.

Land use & tenure

Mainly recreation reserve, the responsibility of the City of Boroondara. Melbourne Water takes responsibility for waterway management. The oval is heavily used for sport and the whole park is well used by walkers (many with dogs).

Physical features

Site area: 4.4 hectares

Elevation: The normal water level of Gardiners Creek and Back Creek is at an elevation of approximately 10 m. The floodplain elevation varies from 13 m in the west to 17 m beside Gardiner Parade.

Landform: Floodplain, riverbanks and streambeds.

Slope: The floodplain is almost flat (1:100 gradient) and there are steep embankments descending several metres to each stream.

Soil type: Alluvium – Pale brown, fine sand above sandy loam.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek Formation. It is well exposed in the bed of Back Creek, and less so in Gardiners Creek.

Site description

The main features of biological interest at Nettleton Park Reserve are:

- Reasonable numbers of River Red Gums (*Eucalyptus camaldulensis*), eight of which are large old trees;
- Four mature Yellow Box (*Eucalyptus melliodora*) trees west of the oval, as good a stand of this species as anywhere in Boroondara;
- Patches of remnant Swamp Paperbarks (*Melaleuca ericifolia*) along Gardiners Creek and Back Creek;
- Approximately 550 m² of the mown floodplain area west of the playing fields has a substantial cover of native ground flora, including *Austrodanthonia racemosa*, *Austrodanthonia setacea*, *Cotula australis*, *Einadia nutans* and *Oxalis perennans*;
- Recent revegetation areas, most of which have replaced woody weeds;
- An unusually good representation of Melbourne suburban native birdlife (as a result of the above features); and
- Some locally threatened graminoid (grass-like) species along both creeks.

Recent weed control work has removed a substantial proportion of the formerly dense deciduous trees (mainly willows and Desert Ash) along the bank of Gardiners Creek and part of the bank of Back Creek. The remainder of Back Creek within the reserve is still densely covered by such weeds. Revegetation has been done to replace the weeds, organised between Council and the Lions Club of Boroondara - Gardiners Creek Inc. The latter organisation is involved in active management and maintains a useful website about the reserve and its vegetation – see <http://www.labyrinth.net.au/~tdp/lions/projects.html>.

The geologically interesting rough, rocky section of riverbed west of the sports pavilion would once have been habitat for specialised indigenous plant species that have since disappeared, but it still attracts visitors' attention (particularly children). Turbulence created by the rocks may also help oxygenate the water, to the benefit of fish.

Ecological links with other land

Nettleton Park Reserve is at the junction between two wildlife corridors, although the Back Creek corridor is barely functional in this role.

The presence and movements of the nomadic bird species, Nankeen Night Heron, Sacred Kingfisher, Brown Goshawk and Collared Sparrowhawk, suggest that these (and probably other) birds migrate along Gardiners Creek. This is perhaps a little surprising, considering the severe fragmentation of native habitat along that corridor. The Collared Sparrowhawk and Brown Goshawk are also seen (frequently, in the latter case) further up Back Creek around Riversdale Rd (Sites 27 and 28), and it seems likely that they move along Back Creek between there and Nettleton Park Reserve.

Some smaller birds such as the Superb Fairy-wren and White-browed Scrubwren are likely to move daily along Gardiners Creek, concentrating on denser patches of undergrowth (particularly where there is Swamp Paperbark). Ducks, other waterbirds and fish move along the waterway itself. The ecological functioning of the creeks is obviously critically dependent on land use further up their catchments.

Some bird species appear to rely on a combination of the habitat in Nettleton Park Reserve and surrounding residential areas. The most notable examples are the Mistletoebird and Tawny Frogmouth.

Habitat types

Perennial Stream (No EVC number). Both creeks provide habitat for fish and other aquatic fauna. Submerged plants were not detected.

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion), tending toward Plains Grassy Woodland (EVC 55, also endangered) in the vicinity of the Yellow Box trees marked on the aerial photograph.

Only vestiges of this EVC remain in the reserve, with as little as ~0.1 hectares having more than 10% native understorey cover. Twenty-two indigenous plant species were found growing wild.

Canopy trees: The native vegetation is dominated by *Eucalyptus camaldulensis*, with smaller numbers of *Eucalyptus melliodora*. However, the riverbanks have larger numbers of introduced deciduous trees, particularly willows and Desert Ash.

Lower trees: Beside both creeks there are scatterings of naturally occurring *Acacia dealbata* and *Melaleuca ericifolia*. Beside Back Creek there are also smaller numbers of *Acacia mearnsii* and *Acacia melanoxylon*.

Shrubs: Among the indigenous plants, the shrub layer comprises some immature *Melaleuca ericifolia* and a solitary *Bursaria spinosa*. Woody weeds such as *Crataegus monogyna*, *Coprosma repens* and *Cotoneaster* species are more abundant.

Vines, ferns: None.

Ground flora: At the water's edge there are moderate numbers of the amphibious indigenous species, *Isolepis cernua*, *Isolepis inundata* and *Juncus gregiflorus*. Patches of *Phragmites australis* grow on the creeks' steep embankments. Two patches of floodplain west of the oval are dominated by *Austrodanthonia racemosa*, with substantial numbers of *Austrodanthonia setacea*, *Cotula australis*, *Einadia nutans* and *Oxalis perennans*. These species on the floodplain are associated less with Floodplain Riparian Woodland than with Plains Grassy Woodland (which once occurred on the adjacent slopes), and their abundance at Nettleton Park Reserve is probably due to altered soil hydrology.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Notes
Vulnerable	<i>Isolepis cernua</i>	Substantial numbers.
Vulnerable	<i>Isolepis inundata</i>	Substantial numbers but localised beside Back Creek.
Vulnerable	<i>Juncus ?pallidus</i>	Very scarce.
Vulnerable	<i>Phragmites australis</i>	Present beside both creeks.
Vulnerable	<i>Eucalyptus melliodora</i>	Four mature, healthy specimens.

Full flora list

The following table includes all species of indigenous plants (naturally occurring and planted) and weeds found at Nettleton Park Reserve by the author or on the planting list kept by the Lions Club of Boroondara - Gardiners Creek inc. Their areas of occurrence have been subdivided into four columns representing the floodplain, the steep bank of Back Creek, the steep bank of Gardiners Creek, and within the creek itself (with root systems normally saturated). In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Species with underlined names represent good resources for collection of seed or cuttings.

Species Name	Floodplain	Back Ck	Gardiners Ck	In water	Species Name	Floodplain	Back Ck	Gardiners Ck	In water	Species Name	Floodplain	Back Ck	Gardiners Ck	In water
Indigenous species (not planted)					Planted indigenous species									
<i>Acacia dealbata</i>		✓			<i>Microlaena stipoides</i>	M	✓	M		<i>Carex appressa</i>		✓		
<i>Acacia mearnsii</i>		-	-		<i>Muellerina eucalyptoides</i>	M				<i>Cassinia ?aculeata</i>	✓			
<i>Acacia melanoxylon</i>		-			<i>Oxalis exilis/perennans</i>	✓				<i>Cassinia longifolia</i>		✓		
<i>Austrodanthonia fulva</i>		-			<i>Phragmites australis</i>		✓	✓		<i>Dianella longifolia</i>	✓	✓		
<i>Austrodanthonia racemosa</i>	M	✓	✓							<i>Eucalyptus camaldulensis</i>	✓	✓		
<i>Austrodanthonia setacea</i>	M				<i>Acacia acinacea</i>	✓	✓			<i>Eucalyptus melliodora</i>	✓	✓		
<i>Bursaria spinosa</i>			-		<i>Acacia dealbata</i>			✓		<i>Eucalyptus ovata</i>	✓	✓		
<i>Cotula australis</i>	M	-			<i>Acacia implexa</i>	✓	✓			<i>Eucalyptus viminalis</i>	✓	✓		
<u><i>Einadia nutans</i></u>	✓				<i>Acacia mearnsii</i>	✓	✓			<i>Goodenia ovata</i>	✓	✓		
<i>Epilobium hirtigerum</i>			-		<i>Acacia melanoxylon</i>	✓	✓			<i>Gynatrix pulchella</i>			✓	
<i>Eucalyptus camaldulensis</i>	D	-	-		<i>Acacia paradoxa</i>	✓				<i>Hardenbergia violacea</i>	✓	✓		
<u><i>Eucalyptus melliodora</i></u>	✓				<i>Acacia pycnantha</i>	✓				<i>Indigofera australis</i>			✓	
<i>Isolepis cernua</i>				✓	<i>Acacia verticillata</i>		✓			<i>Juncus pallidus</i>	✓	✓		
<u><i>Isolepis inundata</i></u>				✓	<i>Acaena novae-zelandiae</i>		✓			<i>Kunzea ericoides</i>	✓	✓		
<i>Juncus gregiflorus</i>				✓	<i>Allocasuarina littoralis</i>	✓				<i>Leptospermum ?scoparium</i>			✓	
<i>Juncus ?pallidus</i>				-	<i>Austrodanthonia fulva</i>	✓				<i>Lomandra longifolia</i>	✓	✓		
<i>Lunularia cruciata</i>		✓	✓		<i>Austrodanthonia setacea</i>	✓				<i>Melaleuca ericifolia</i>			✓	
<u><i>Melaleuca ericifolia</i></u>	D	D			<i>Bursaria spinosa</i>	✓	✓			<i>Microlaena stipoides</i>	✓			
					<i>Callistemon sieberi</i>		✓			<i>Melicytus dentatus</i>	✓	✓		
										<i>Olearia lirata</i>	✓	✓		

Species Name	Floodplain			Species Name	Floodplain			Species Name	Floodplain		
	Back Ck	Gardiners Ck	In water		Back Ck	Gardiners Ck	In water		Back Ck	Gardiners Ck	In water
<i>Olearia ramulosa</i>	✓	✓		<i>Conyza sumatrensis</i>		✓		<i>Pittosporum undulatum</i>			✓
<i>Ozothamnus ferrugineus</i>		✓		<i>Coprosma repens</i>			✓	<i>Plantago coronopus</i>		✓	
<i>Poa ensiformis</i>		✓		<i>Cotoneaster glaucophyllus</i>		✓	✓	<i>Plantago lanceolata</i>		✓	
<i>Poa labillardierei</i>	✓	✓		<i>Cotoneaster pannosus</i>			✓	<i>Prunus cerasifera</i>		✓	✓
<i>Prostanthera lasianthos</i>		✓		<i>Cotula coronopifolia</i>			✓	<i>Pyracantha ?angustifolia</i>		✓	✓
<i>Rapanea howittiana</i>		✓		<i>Crataegus monogyna</i>			✓	<i>Quercus robur</i>		✓	✓
<i>Solanum aviculare</i>		✓	✓	<i>Cynodon dactylon</i>		✓	✓	<i>Ranunculus repens</i>		✓	✓
<i>Solanum laciniatum</i>		✓		<i>Dactylis glomerata</i>		✓	✓	<i>Romulea rosea</i>		✓	
<i>Viminaria juncea</i>		✓		<i>Delairea odorata</i>		✓	✓	<i>Rubus ?anglocandicans</i>		✓	✓
Other planted species (not weeds)				<i>Ehrharta erecta</i>		✓	✓	<i>Sagina apetala</i>		✓	
<i>Carex tereticaulis</i>	✓	✓		<i>Erigeron karvinskianus</i>		✓	✓	<i>Salix ?fragilis</i>		✓	✓
<i>Casuarina ?cunningham-</i>	✓			<i>Foeniculum vulgare</i>		✓	✓	<i>Salix ?×reichardtii</i>			✓
<i>Dodonaea viscosa</i>			✓	<i>Fraxinus angustifolia</i>		✓	✓	<i>Salpichroa origanifolia</i>			✓
<i>Myoporum</i> sp. 1			✓	<i>Fumaria</i> sp.		✓	✓	<i>Solanum nigrum</i>			✓
Weed species				<i>Galium aparine</i>		✓	✓	<i>Solanum pseudocapsicum</i>			✓
<i>Acacia ?saligna</i>		✓		<i>Gamochaeta purpurea</i>		✓		<i>Sonchus oleraceus</i>			✓
<i>Acer negundo</i>		✓		<i>Genista monspessulana</i>		✓		<i>Sporobolus africanus</i>		✓	✓
<i>Agapanthus praecox</i> subsp. <i>orientalis</i>			✓	<i>Hedera helix</i>		✓	✓	<i>Taraxacum</i> sp.		✓	
<i>Agrostis capillaris</i>		✓		<i>Holcus lanatus</i>		✓	✓	<i>Tradescantia fluminensis</i>		✓	✓
<i>Allium triquetrum</i>		✓		<i>Hypochoeris radicata</i>		✓		<i>Trifolium repens</i>		✓	
<i>Aster subulatus</i>		✓		<i>Juncus articulatus</i>			✓	<i>Tropaeolum majus</i>		✓	✓
<i>Avena</i> sp.			✓	<i>Ligustrum lucidum</i>		✓	✓	<i>Ulex europaeus</i>		✓	✓
<i>Brassica ?fruticulosa</i>		✓	✓	<i>Ligustrum vulgare</i>		✓		<i>Vinca major</i>			✓
<i>Briza maxima</i>		✓		<i>Lolium perenne</i>		✓	✓	<i>Watsonia meriana</i> var. <i>bulbillifera</i>		✓	✓
<i>Bromus catharticus</i>			✓	<i>Lycium ferocissimum</i>			✓	<i>Zantedeschia aethiopica</i>		✓	
<i>Bromus diandrus</i>		✓	✓	<i>Nassella neesiana</i>		✓					
<i>Cerastium glomeratum</i>		✓		<i>Oxalis pes-caprae</i>		✓	✓				
				<i>Pennisetum clandestinum</i>		✓					
				<i>Phalaris aquatica</i>			✓				

Large old trees

Eight River Red Gums (*Eucalyptus camaldulensis*) at Nettleton Park Reserve have trunk diameters exceeding 0.8 m, which qualifies them as 'large old trees' according to the Department of Sustainability & Environment's criteria. They are all circled in yellow on the aerial photograph on page 208. The largest trunk diameter is 93 cm. They are generally in good health, but one next to the sports pavilion is heavily laden with Creeping Mistletoe that may threaten its future.

Fauna of special significance

The significant fauna species in the list below have been observed at Nettleton Park Reserve. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18). Only the Black-faced Cuckoo-shrike was confirmed to have bred in the reserve, but the Australian Hobby once bred on a neighbouring electricity pylon.

Conservation Status			Species Name	Last Record	Notes
Victoria	Melbourne	Boroondara			
Near Threatened	Secure	Endangered	Nankeen Night Heron	2004	Overhead periodically
	Rare	Occasional Visitor	Collared Sparrowhawk	2004	Occasional visits
		Endangered	Sacred Kingfisher	2004	Each summer
		Endangered	Spotted Pardalote	2004	Frequent
		Endangered	Crested Shrike-tit	1979	Unlikely to return
		Vulnerable	Brown Goshawk	2004	Occasional visits
		Vulnerable	Australian Hobby	2004	Occasional visits
		Vulnerable	Musk Lorikeet	2004	Seasonal
		Vulnerable	Eastern Rosella	2004	Frequent

Conservation Status			Species Name	Last Record	Notes
Victoria	Melbourne	Boroondara			
		Vulnerable	Laughing Kookaburra	2003	Infrequent
		Vulnerable	Tawny Frogmouth	2004	Resident
		Vulnerable	Superb Fairy-wren	2004	Resident
		Vulnerable	White-browed Scrubwren	2004	Resident
		Vulnerable	Grey Fantail	2003	Rare visitor
		Vulnerable	Black-faced Cuckoo-shrike	2004	Seasonal; Most years
		Vulnerable	Mistletoebird	2004	Frequent
		Occasional Visitor	Barn Owl	1979	
		Occasional Visitor	Yellow-faced Honeyeater	1979	
		Occasional Visitor	Olive-backed Oriole	1996	

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species. An unidentified Water-skink is omitted from the list.

Fish		*Spotted Turtle-Dove	2004	Noisy Miner	2004
*Carp	2004	Galah	2004	Yellow-faced Honeyeater	1979
		Sulphur-crested Cockatoo		White-plumed Honeyeater	2004
Mammals		Rainbow Lorikeet	2004	Crested Shrike-tit	1979
Common Brushtail Possum	2004	Musk Lorikeet	2004	Magpie-lark	2004
Common Ringtail Possum	2004	Eastern Rosella	2004	Grey Fantail	2003
		Red-rumped Parrot	2004	Willie Wagtail	2004
		Barn Owl	1979	Black-faced Cuckoo-shrike	2004
Birds		Tawny Frogmouth	2004	Olive-backed Oriole	1996
*Mallard	1988	Laughing Kookaburra	2003	Grey Butcherbird	2004
Pacific Black Duck	2004	Sacred Kingfisher	2004	Australian Magpie	2004
Nankeen Night Heron	2004	Superb Fairy-wren	2004	Mistletoebird	2004
Brown Goshawk	2004	Spotted Pardalote	2004	Welcome Swallow	2004
Collared Sparrowhawk	2004	White-browed Scrubwren	2004	*Common Blackbird	2004
Australian Hobby	2004	Brown Thornbill	2004	*Common Starling	2004
Dusky Moorhen	2004	Red Wattlebird	2004	*Common Myna	2004
*Rock Dove	2004	Brush Wattlebird	2004		

Fauna habitat

The River Red Gums provide feeding and roosting sites for common species such as the Red Wattlebird (*Anthochaera carunculata*) and White-plumed Honeyeater (*Lichenostomus penicillatus*). The abundance of Creeping Mistletoe (*Muellerina eucalyptoides*) on the River Red Gums provides food for the Mistletoebird (*Dicaeum hirundinaceum*).

At least one of the River Red Gums contains a hollow and there are nest boxes on site, but they did not appear to be utilised by any diurnal species at the time of the survey. Bat-boxes also appeared to be empty.

Plantations along Gardiners Creek provide habitat for small insectivorous birds such as the Superb Fairy Wren (*Malurus cyaneus*). The sheltered nature of Back Creek together with the sprawling non-indigenous vegetation is utilised by the White-browed Scrub Wren (*Sericornis frontalis*). The shrubby vegetation along both creeks provides foraging habitat for Brown Thornbill as well as roosting sites and vantage points from which some other species seek food. For example, a Grey Butcherbird (*Cracticus torquatus*) was observed capturing a water skink from the boulders lining Gardiners Creek and a Willie Wagtail (*Rhipidura leucophrys*) fed on the ground in close proximity to the shelter from wind and predators provided by the tree-lined creeks.

The sheltered nature of the creeks would provide bird bathing and drinking opportunities during the hot summer months. There is sufficient vegetation (albeit non-indigenous) overhanging Gardiners Creek to support the Dusky Moorhen (*Gallinula tenebrosa*) observed at the site.

The high-voltage powerlines and pylon provide a roosting site for the Australian Hobby (*Falco longipennis*). There is sufficient broad, sheltered space and connectivity to other parkland of Gardiners Creek and Back Creek to support the Brown Goshawk (*Accipiter fasciatus*).

Mown open spaces provide feeding grounds for indigenous birds such as the Magpie-Lark (*Grallina cyanoleuca*) and introduced species such as the Common Starling (*Sturnus vulgaris*).

Bird census results

A twenty-minute bird census was carried out as part of the bird survey by David Lockwood on 1st October 2004. He recorded eight indigenous species and four introduced species. The species with the highest counts were Red Wattlebird (7), Spotted Turtle-Dove (5) and Common Blackbird (5). Common urban species greatly predominated.

Site significance ratings

The following is an assessment of the site against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

Nettleton Park Reserve fits the description in BioSites criterion 1.2.6 of 'Corridor or component of 'stepping stones' (includes riparian corridor...) ...important at Local scale', thereby qualifying for **Local** significance.

BioSites criterion 1.1.1 attributes local significance to 'All parts of riparian systems with riparian vegetation present'. The riparian native vegetation in this site is so sparse that it probably does not qualify under this criterion, but this could change as the revegetation matures.

Rare or threatened plants

Of the five locally threatened species listed beneath the heading 'Flora of special significance' above, all but *Juncus pallidus* appear to have viable populations (taking into account opportunities for exchange of seed and pollen with plants outside the reserve). A site with any viable population of a locally threatened species is of **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

The locally threatened bird species listed as resident, seasonal or frequent in the section heading 'Flora of special significance' above give the reserve **Local** significance according to BioSites criterion 3.1.5.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
<p>Environmental weeds. The species of concern are:</p> <ul style="list-style-type: none"> • Serious: Cotoneaster (<i>Cotoneaster pannosus</i>), Hawthorn (<i>Crataegus monogyna</i>), Cocksfoot (<i>Dactylis glomerata</i>), Cape Ivy (<i>Delairea odorata</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Cleavers (<i>Galium aparine</i>), Ivy (<i>Hedera helix</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Cherry-plum (<i>Prunus cerasifera</i>), Creeping Buttercup (<i>Ranunculus repens</i>), Crack Willow (<i>Salix ?fragilis</i>), Pampas Lily-of-the-Valley (<i>Salpichroa organifolia</i>), Wandering Jew (<i>Tradescantia fluminensis</i>), Nasturtium (<i>Tropaeolum majus</i>), Gorse (<i>Ulex europaeus</i>), Blue Periwinkle (<i>Vinca major</i>), Bulbil Watsonia (<i>Watsonia meriana</i> var. <i>bulbillifera</i>); • Moderately serious: Box Elder (<i>Acer negundo</i>), Angled Onion (<i>Allium triquetrum</i>), Oat (<i>Avena</i> sp.), Twiggy Turnip (<i>Brassica ?fruticulosa</i>), Large Quaking-grass (<i>Briza maxima</i>), Prairie Grass (<i>Bromus catharticus</i>), Great Brome (<i>Bromus diandrus</i>), Fleabane (<i>Conyza sumatrensis</i>), Mirror-bush (<i>Coprosma repens</i>), Cotoneaster (<i>Cotoneaster glaucophyllus</i>), Couch (<i>Cynodon dactylon</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Fennel (<i>Foeniculum vulgare</i>), unidentified fumitory (<i>Fumaria</i> sp.), Montpellier Broom (<i>Genista monspessulana</i>), Yorkshire Fog (<i>Holcus lanatus</i>), Cat's Ear (<i>Hypochoeris radicata</i>), Jointed Rush (<i>Juncus articulatus</i>), Large-leafed Privet (<i>Ligustrum lucidum</i>), European Privet (<i>Ligustrum vulgare</i>), African Box-thorn (<i>Lycium ferocissimum</i>), Chilean Spear-grass (<i>Nassella neesiana</i>), Soursob (<i>Oxalis pes-caprae</i>), Toowoomba Canary-grass (<i>Phalaris aquatica</i>), Buck's-horn Plantain (<i>Plantago coronopus</i>), Ribwort (<i>Plantago lanceolata</i>), Orange Firethorn (<i>Pyracantha ?angustifolia</i>), English Oak 	All	High to Moderate	Current

Threat	Natural assets affected	Severity	When?
(<i>Quercus robur</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Pussy Willow (<i>Salix ?×reichardtii</i>), Madeira Winter-cherry (<i>Solanum pseudocapsicum</i>), Indian Rat-tail Grass (<i>Sporobolus africanus</i>), White Arum Lily (<i>Zantedeschia aethiopica</i>).			
Predation by foxes and cats.	Birds	Moderate	Current
Dogs scaring off birds and thereby preventing birds from breeding.	Birds	Moderate	Current
Mistletoes debilitating eucalypts.	Eucalypts	Unknown	Current
Eucalypt dieback disease (of which leaf skeletonisers were the main cause in 2004).	Trees; Eucalypt-dependent fauna; Wildlife corridor	Low to moderate	Current
Red Wattlebirds chasing away other bird species.	Birds; Tree health	Low to moderate	Current

Priority actions

1. Remove the two plants of the serious weed, Chilean Needle-grass (*Nassella neesiana*), beside Gardiners Creek at the location marked on the aerial photograph on page 208, in November. Follow up in following Novembers until the species is confidently eradicated. The importance is moderate and the urgency is high.
2. As at November 2004, some patches of the Gardiners Creek embankment had been cleared of deciduous trees without indigenous species being planted to replace them. *Acacia dealbata* and *Melaleuca ericifolia* would be useful for quickly restoring vegetation cover and bank stability. The importance and urgency are moderate.
3. Maintain routine weed control in areas recently revegetated, and replace destroyed plants if necessary. The importance and urgency are moderate.
4. Seek arboricultural advice about the extent to which Creeping Mistletoe threatens the survival or health of the River Red Gums, particularly one just southeast of the sports pavilion and a smaller one near a pylon just southwest of the playing fields. The importance and urgency are moderate.
5. Cease mowing the existing ground flora around the Yellow Boxes, then conduct enrichment planting (but taking care not to dig up existing indigenous flora in the process). Keep records of the species planted. The importance and urgency are moderate.

Past management and revegetation

Recent weed control work by Melbourne Water has removed a substantial proportion of the formerly dense deciduous trees (mainly willows and Desert Ash) along the banks of Gardiners Creek and Back Creek. Revegetation with indigenous species and mulched beds has been done by the Lions Club of Boroondara - Gardiners Creek Inc in collaboration with Melbourne Water and the City of Boroondara to replace the weeds, using an unusually rich range of indigenous species. The club also aims to encourage natural regeneration.

Revegetation plots with indigenous understorey species have also been created beneath remnant River Red Gums near the sports pavilion and near the footbridge in the site's south.

Some of the revegetation has entered a second generation, which is an uncommon and very encouraging sign of sustainability. The species involved include *Acacia melanoxylon*, *Acacia dealbata*, *Eucalyptus camaldulensis* and *Melaleuca ericifolia*.

Indigenous ground flora on the floodplain west of the playing fields is mown low and frequently. No effort appears to be made to conserve the indigenous plants there, but the plants are persisting under a mowing regime that has probably changed little over decades. Priority Action 5 above offers an alternative management approach.

Future revegetation

In addition to priority action 2 above, the revegetation areas that have already been established would be well complemented by an additional area on the floodplain to the west of the playing fields, near the Yellow Box trees marked on the aerial photograph on page 208. Rather than use the technique of planting into a mulched bed, an alternative would be to plant into the two existing patches that have predominantly indigenous ground flora, and cease mowing these areas. Fencing would be needed initially. Suitable species for planting include the following:

Shrubs and small trees

<i>Acacia implexa</i>	Lightwood
<i>Acacia paradoxa</i>	Hedge Wattle
<i>Acacia pycnantha</i>	Golden Wattle
<i>Bursaria spinosa</i>	Sweet Bursaria
<i>Meliccytus dentatus</i>	Tree Violet
<i>Ozothamnus ferrugineus</i>	Tree Everlasting

Wildflowers

<i>Chrysocephalum semipapposum</i>	Clustered Everlasting
<i>Convolvulus angustissimus</i>	Pink Bindweed
<i>Dianella longifolia</i> s.l.	Pale Flax-lily
<i>Goodenia ovata</i>	Hop Goodenia

<i>Hardenbergia violacea</i>	Purple Coral-pea
<i>Indigofera australis</i>	Austral Indigo
<i>Leptorhynchos squamatus</i>	Scaly Buttons
<i>Leptorhynchos tenuifolius</i>	Wiry Buttons
<i>Pelargonium australe</i>	Austral Stork's-bill
<i>Pimelea humilis</i>	Common Rice-flower
<i>Veronica gracilis</i>	Slender Speedwell
<i>Veronica plebeia</i>	Trailing Speedwell
<i>Viola hederacea</i>	Ivy-leaf Violet
<i>Wahlenbergia communis</i>	Tufted Bluebell
<i>Wahlenbergia gracilis</i>	Sprawling Bluebell
<i>Wahlenbergia multicaulis</i>	Tadgell's Bluebell

The objective is to extend the available small bird habitat away from the very narrow riparian strip, with some prickly elements to limit access by people and dogs. Some of the bird species that are intended to be encouraged by such a planting are the Grey Fantail (*Rhipidura fuliginosa*) and Golden Whistler (*Pachycephala pectoralis*).

Records should be kept of any planting done in this (or any other) site, including species, numbers and locations. The Lions Club's website is doing this very well.

Future removal of deciduous trees and other woody weeds along the creeks should be done incrementally in stretches of about thirty metres at a time so that bird habitat is not overly affected. Trees that are removed should be replaced by the staple species River Red Gum, Silver Wattle (*Acacia dealbata*) and Swamp Paperbark (*Melaleuca ericifolia*). Other indigenous species can be added, as has been done in previous revegetation along the riverbanks in the reserve.

Monitoring

Chilean Needle-grass should be monitored each November at the location shown on the aerial photograph, and also on the brow of the Back Creek embankment northwest of the playing fields, where another patch was destroyed in October 2004.

The amount of mistletoe on the River Red Gums should be monitored approximately every four years by an arborist with appropriate experience in mistletoe damage to eucalypts.

The only pre-existing data suitable for ecological monitoring appears to be records of plantings and their progeny that the Lions Club of Boroondara - Gardiners Creek Inc. keeps on its website.

The following items have been gathered to provide additional data for future monitoring:

- The flora lists for each of four areas, as provided beneath the heading 'Full flora list' above. Repeat in spring every two to four years. Check for changes in the species present or their abundances;
- Ratings of the seriousness of each weed species, as provided above in the section headed 'Threats';
- Bird lists, including the results of a standard twenty-minute bird census on 1st October 2004. Repeat in spring every two to four years. Check for changes in abundance of birds or the species present.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of six hours and twenty-five minutes on 21st October and 25th November 2004, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species in four parts of the reserve, including the indigenous species' abundances and the threat level of all weed species in each area;
 - Mapping, counting and recording populations of plant species that are rare or threatened in the site or more generally;
 - Individual measurement of all large old River Red Gums;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- A daytime bird survey by David Lockwood on 1st October 2004 according to the protocol discussed in Section 2.4.1, including a twenty-minute bird census;
- Spotlighting for thirty minutes on the night of 21st October 2004;
- Information about past plantings from Trevor Phillips of the Lions Club of Boroondara - Gardiners Creek Inc, and from that group's website (<http://www.labyrinth.net.au/~tdp/lions/projects.html>). Mr Phillips also provided three useful bird records (Galah, Sulphur-crested Cockatoo and Laughing Kookaburra);
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases;

- The Department of Sustainability & Environment's BioMaps of the area;
- Aerial photography from August 2004;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

No further investigation is recommended here, other than the monitoring proposed above.

Acknowledgment

Thanks to Jack Krohn, local bird observer and cricketer, for his observations of birds at and near Nettleton Park Reserve since the 1960s.

Thanks also to the Lions Club of Boroondara - Gardiners Creek Inc, and particularly Trevor Phillips, for information about the history and planning of revegetation in the reserve, and for their efforts in looking after the reserve's conservation values.

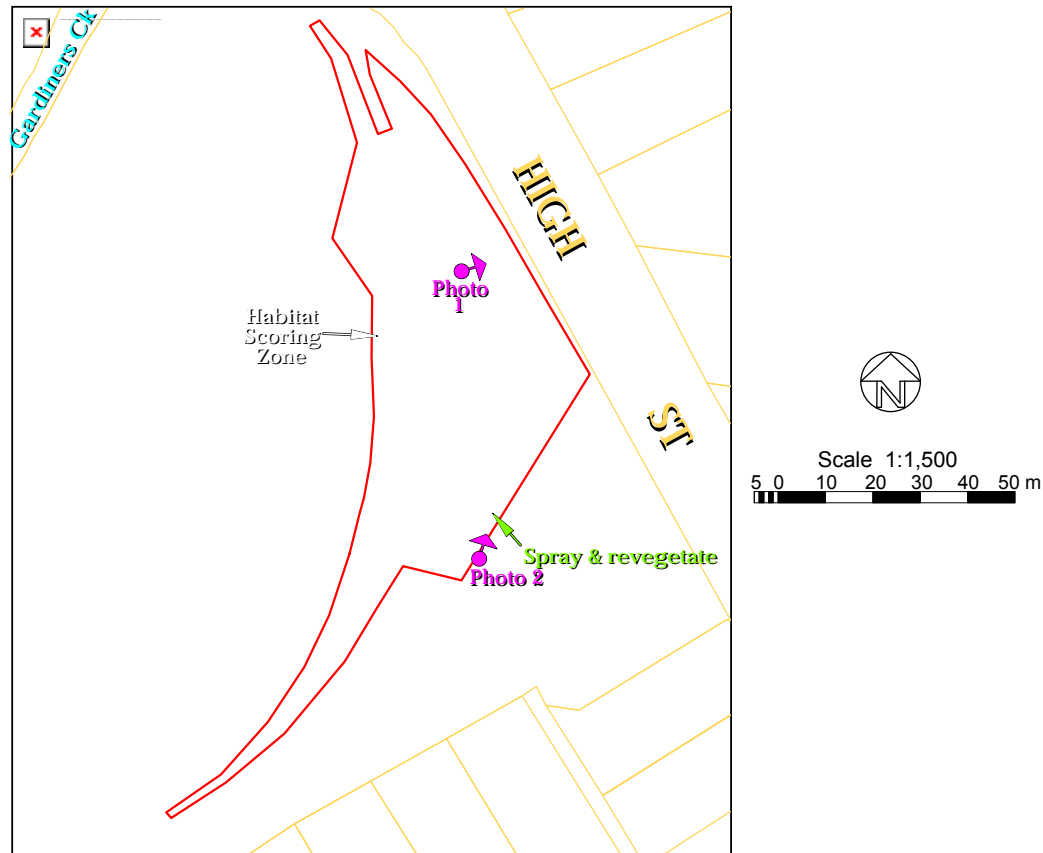
Site 22. Eric Raven Reserve, Glen Iris

Natural regeneration of native vegetation between High St and an oval in Glen Iris. Melway ref. 59 K9.

Site Biological Significance Level: *Local*

Summary of significant natural assets:

- Unexpectedly rich natural regeneration of the endangered Ecological Vegetation Class, Plains Grassy Woodland;
- Viable populations of at least five plant species that are threatened in Boroondara, including the only population of Short Wallaby-grass (*Austrodanthonia carphoides*) for a radius of approximately twenty kilometres.



Boundaries

The site is outlined in red on the aerial photograph. The boundary along High St and the adjoining straight line segment to the south follow lines of bollards. From the second-most-southerly bollard, a boundary segment heads straight downhill to the top of the oval embankment. Nearly all of the oval embankment is within the boundary. The northwestern segments of the boundary encompass several revegetation beds and deviate around a section of a vehicle track.

Land use & tenure

Public park, the responsibility of the City of Boroondara.

Physical features

Site area: 0.37 hectares

Elevation: 18 m beside the oval to 28 m in the eastern corner.

Landform: Gentle lower valley slope.

Slope: Embankments beside the oval and High St are narrow but steep. The remainder of the site slopes down from High Street to the playing field with an average gradient of 1:5.

Soil type: Loam over clay subsoil.

Underlying geology: The soil is derived from the decomposition of the underlying Silurian sedimentary rock of the Andersons Creek Formation, which is characterised by siltstones and sandstones.

Site description

It is remarkable that a patch of woodland has been able to regenerate naturally on this site, immediately uphill of an oval in Glen Iris. Until recently, the oval embankment and the abutting slope was regularly mown and used as a sitting area for watching games on the oval. Five oaks have been planted in an arc at the top of the oval embankment, and various other non-indigenous trees have been planted elsewhere, in the typical style of suburban parks and gardens.

However, a modest density of native ground storey species persisted. When the presence of Kangaroo Grass (*Themeda triandra*), Curved Rice-flower (*Pimelea curviflora*) and some other indigenous ground flora was noticed several years ago, mowing of part of the slope ceased to allow regeneration. Bollards were installed at the edges for demarcation.

The result has been a very rewarding regeneration of the endangered Ecological Vegetation Class, Plains Grassy Woodland. The mass germinations included numerous River Red Gums near a remnant parent tree, and various wildflowers such as the Pink Bindweed, *Convolvulus angustissimus*. Native grasses have proliferated, including the only population of Short Wallaby-grass (*Austrodanthonia carphoides*) for a radius of approximately twenty kilometres.

The main area of predominantly native understorey is outlined in white on the aerial photograph. It is interrupted by areas of exotic grass and weeds beneath the oaks, which appear to be having a negative effect on the native vegetation. Native ground flora extend to the site's southern tip, mixed with more introduced species than within the white-outlined area.

Council has planted indigenous tubestock within the natural vegetation, particularly on the oval embankment. Some of the species selected do not naturally occur in Plains Grassy Woodland, but their flowers may be appreciated by visitors. These plantings have made it difficult to determine whether three particular indigenous species have been planted or have germinated naturally.

Council has also created revegetation beds in the north, beside a track that provides access from High St to the oval for management vehicles. This area is potentially important as a link for native fauna to move between the site and the Gardiners Creek wildlife corridor.

Ecological links with other land

This site is so small that almost any fauna within it must rely on other areas to complete their habitat needs.

The site is separated from the revegetated corridor of Gardiners Creek by less than twenty metres. Birds and insects that move along the corridor would have little difficulty digressing into the site, attracted by the eucalypts and indigenous ground flora. This appeared to apply to the White-plumed Honeyeaters observed in the site's trees. The author was also surprised to find a Common Long-necked Tortoise walking through the site near High St toward Gardiners Creek.

Habitat type

Plains Grassy Woodland (EVC 55, **endangered** in the Gippsland Plain bioregion). Approximately 1,500 m² has >10% native understorey cover. Twenty-eight indigenous plant species were found growing naturally.

Canopy trees: *Eucalyptus camaldulensis* and *Eucalyptus melliodora*.

Lower trees: Dominated by *Acacia mearnsii*, which may have been planted. There are also some *Acacia melanoxylon*, which may also have been planted.

Shrubs: No indigenous shrubs remain. Several shrubs have been planted, but they are of species that occur naturally in EVCs other than Plains Grassy Woodland.

Vines and ferns: There is one *Hardenbergia violacea* and two *Convolvulus angustissimus*.

Ground flora: Dominated variously by the native grasses, *Austrodanthonia racemosa*, *Austrodanthonia setacea*, *Microlaena stipoides* and *Themeda triandra*, mixed with rather large numbers of the weed grass, *Briza maxima*. The following species are abundant but not dominant: *Elymus scaber*, *Lomandra filiformis* subsp. *coriacea* and *Tricoryne elatior*. The characteristic species, *Acaena agnipila*, *Dichelachne crinita*, *Pimelea curviflora* and *Veronica gracilis* are also present.

Habitat Score

Habitat scoring (see page 13) was conducted for the 1,500 m² that has predominantly indigenous understorey, outlined in white on the aerial photograph on page 217. The scoring was done because the native ground flora was among the richest in Boroondara. Using the benchmark for Plains Grassy Woodland (EVC 55), the calculated habitat score was 39%. This is within the typical range for urban bushland remnants. The richness and structure of the understorey contributed fifteen percentage points, which is not often exceeded in urban bushland. Ten percentage points were lost for the absence of large

old trees, and 24 percentage points were lost for the small size of the patch and the paucity of native vegetation in the surrounding district.

An increase in habitat score of one percentage point would raise the conservation significance rating under the Victorian Native Vegetation Framework from the High category to the Very High category. This could be achieved by removing some of the leaf litter on the ground, due to a quirk of the habitat scoring method; however there are no ecological grounds for doing so. Weed control could also achieve a gain of four percentage points.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Notes
Critically Endangered	<i>Austrodanthonia carphoides</i>	Nineteen plants were found.
Critically Endangered	<i>Hardenbergia violacea</i>	A single individual was found near High St.
Critically Endangered	<i>Pimelea curviflora</i>	A single, very large individual was found.
Endangered	<i>Convolvulus angustissimus</i>	Two individuals grow close to High St.
Endangered	<i>Pseudognaphalium luteoalbum</i>	Two individuals were on the steps by the oval.
Endangered	<i>Veronica gracilis</i>	Two natural plants plus several planted ones.
Vulnerable	<i>Austrodanthonia laevis</i>	Moderate numbers were found.
Vulnerable	<i>Carex breviculmis</i>	Very scarce.
Vulnerable	<i>Juncus subsecundus</i>	Moderate numbers were found.
Vulnerable	<i>Acaena agnipila</i>	Six plants were recorded.
Vulnerable	<i>Solenogyne dominii</i>	Moderate numbers were found.

Full flora list

The following table includes all species of indigenous plants (naturally occurring and planted) and weeds found at the Eric Raven Reserve remnant patch by the author. An obelisk (†) preceding the names of three species indicates that they may have been planted. In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Species with underlined names represent good resources for collection of seed or cuttings. Some planted species may not be listed.

Species Name	Abundance	Species Name	Abundance	Species Name	Abundance	
Wild indigenous species (28 spp.)				<i>Bromus hordeaceus</i>	✓	
† <i>Acacia mearnsii</i>	D	<i>Oxalis exilis/perennans</i>	✓	<i>Cotoneaster glaucophyllus</i>	✓	
† <i>Acacia melanoxylon</i>	✓	<i>Pimelea curviflora</i>	-	<i>Cynodon dactylon</i>	✓	
<i>Acaena agnipila</i>	✓	<i>Pseudognaphalium luteoalbum</i>	-	<i>Dactylis glomerata</i>	✓	
<i>Arthropodium strictum</i>	-	<u><i>Solenogyne dominii</i></u>	✓	<i>Ehrharta erecta</i>	✓	
<u><i>Austrodanthonia carphoides</i></u>	✓	<u><i>Themeda triandra</i></u>	D	<i>Ehrharta longiflora</i>	✓	
<u><i>Austrodanthonia laevis</i></u>	✓	<u><i>Tricoryne elatior</i></u>	M	<i>Galium aparine</i>	✓	
<i>Austrodanthonia racemosa</i>	D	<i>Veronica gracilis</i>	-	<i>Gaudinia fragilis</i>	✓	
<i>Austrodanthonia setacea</i>	D	Planted indigenous species (28 spp.)			<i>Hypochoeris radicata</i>	✓
<i>Carex breviculmis</i>	-	<i>Acacia acinacea</i>	✓	<i>Juncus capitatus</i>	✓	
<i>Convolvulus angustissimus</i>	✓	<i>Chrysocephalum ?semipapposum</i>	✓	<i>Lolium perenne</i>	✓	
<i>Dichelachne crinita</i>	✓	<i>Lomandra longifolia</i>	✓	<i>Lotus subbiflorus</i>	✓	
<u><i>Elymus scaber</i></u>	M	<i>Melicytus dentatus</i>	✓	<i>Medicago polymorpha</i>	✓	
<i>Epilobium ?hirtigerum</i>	-	<i>Olearia ramulosa</i>	✓	<i>Nassella neesiana</i>	✓	
<i>Eucalyptus camaldulensis</i>	M	<i>Poa morrisii</i>	✓	<i>Paspalum dilatatum</i>	✓	
† <i>Eucalyptus melliodora</i>	✓	<i>Veronica gracilis</i>	✓	<i>Pittosporum undulatum</i>	✓	
<i>Hardenbergia violacea</i>	-	Weed species (28 spp.)			<i>Plantago lanceolata</i>	✓
<i>Juncus bufonius</i>	✓	<i>Aira elegantissima</i>	✓	<i>Quercus</i> sp.	✓	
<i>Juncus subsecundus</i>	✓	<i>Anthoxanthum odoratum</i>	✓	<i>Romulea rosea</i>	✓	
<i>Lomandra filiformis coriacea</i>	M	<i>Avena barbata</i>	✓	<i>Sonchus oleraceus</i>	✓	
<u><i>Microlaena stipoides</i></u>	D	<i>Briza maxima</i>	✓	<i>Sporobolus africanus</i>	✓	
<i>Muellerina eucalyptoides</i>	✓	<i>Briza minor</i>	✓	<i>Vulpia bromoides</i>	✓	
		<i>Bromus catharticus</i>	✓			

Fauna of special significance

The significant fauna species in the list below have been observed within the whole of Eric Raven Reserve. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Last Record	Notes
Endangered	Water Rat or Rakali	2002	Sighting reported by Quin <i>et al.</i> (2004).
Endangered	Spotted Pardalote	2004	
Endangered	Yellow-rumped Thornbill	2000	
Vulnerable	Common Long-necked Tortoise	2004	Walking through, from the High St footpath.
Vulnerable	White-faced Heron	2004	Seen on the oval.
Vulnerable	Eastern Rosella	2004	
Vulnerable	White-browed Scrubwren	2000	
Vulnerable	Black-faced Cuckoo-shrike	2000	
Data Deficient	Australian Raven	2000	Possibly a misidentified Little Raven.

Full fauna list

The following list is for the whole of Eric Raven Reserve, not just the section described as a site here. The name of each species is followed by the most recent year in which it has been recorded. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies		Grey Teal	2000	Brush Wattlebird	2000
*Cabbage White	2004	†Chestnut Teal	2000	Noisy Miner	2004
Australian Painted Lady	2004	Little Pied Cormorant	2000	†White-plumed Honeyeater	2004
†Common Brown	2004	White-faced Heron	2004	†Magpie-lark	2000
Klug's Xenica	2004	Purple Swamphen	2000	Willie Wagtail	2004
		Dusky Moorhen	2000	Black-faced Cuckoo-shrike	2000
Reptiles		Silver Gull	2004	Grey Butcherbird	2004
Common Long-necked Tortoise	2004	†*Spotted Turtle-Dove	2004	†Australian Magpie	2004
		Galah	2000	Australian Raven	2000
Mammals		Sulphur-crested Cockatoo	2000	Little Raven	2004
Water Rat or Rakali	2002	Rainbow Lorikeet	2004	Corvid	2000
		Eastern Rosella	2004	†*House Sparrow	2000
Birds		Spotted Pardalote	2004	Welcome Swallow	2004
Australian Wood Duck	2000	White-browed Scrubwren	2000	*Common Blackbird	2004
Pacific Black Duck	2000	Yellow-rumped Thornbill	2000	*Common Starling	2004
		†Red Wattlebird	2004	*Common Myna	2000

Fauna habitat

The extensive cover of native grasses represents good habitat for certain native butterflies and other insects. Native parrots such as the Red-rumped Parrot may well feed on the grass seed, but bird observations have not been taken at the right time of year to check this. Non-indigenous eucalypts augment the small number of indigenous eucalypts, making the habitat more attractive for fauna such as the Eastern Rosellas seen in Sugar Gums.

It is not clear what attracted a Common Long-necked Tortoise to the site.

Site significance ratings

The following is an assessment of the site against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

This site approximately fits the description in BioSites criterion 1.2.6 of 'Corridor or component of 'stepping stones' (includes riparian corridor...) ...important at Local scale', thereby qualifying for **Local** significance.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), any native vegetation belonging to an endangered EVC with a habitat score of 39% (as in the case of the present site) has a conservation significance rating of High. If the habitat score rises one percentage point, the conservation significance rises to Very High.

According to BioSites criterion 3.2.3, State significance applies to any site with a 'remnant patch' whose conservation significance is High or Very High due to the presence of a threatened EVC. This does not apply to the present site because it is too small to qualify as a remnant patch. In this circumstance, the BioSites criteria recognise no significance at all.

Rare or threatened plants

At least four of the locally threatened species listed beneath the heading 'Flora of special significance' above have viable populations, the most important being *Austrodanthonia carphoides*. A site with any viable population of a locally threatened species is of **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

The reported presence of the locally endangered Water Rat (or Rakali) qualifies the site for Local significance according to BioSites criterion 3.1.5, on the assumption that the presence is part of a viable population.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Large Quaking-grass (<i>Briza maxima</i>); • Moderately serious: Sweet Vernal-grass (<i>Anthoxanthum odoratum</i>), Bearded Oat (<i>Avena barbata</i>), Prairie Grass (<i>Bromus catharticus</i>), Cotoneaster (<i>Cotoneaster glaucophyllus</i>), Couch (<i>Cynodon dactylon</i>), Cocksfoot (<i>Dactylis glomerata</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Cleavers (<i>Galium aparine</i>), Cat's Ear (<i>Hypochoeris radicata</i>), Hairy Bird's-foot Trefoil (<i>Lotus subbiflorus</i>), Chilean Spear-grass (<i>Nassella neesiana</i>), Paspalum (<i>Paspalum dilatatum</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Ribwort (<i>Plantago lanceolata</i>), Oak (<i>Quercus</i> sp.), Common Onion-grass (<i>Romulea rosea</i>), Indian Rat-tail Grass (<i>Sporobolus africanus</i>), Squirrel-tail Fescue (<i>Vulpia bromoides</i>). 	All	High (<i>Briza</i>) to Moderate	Current
Pin Oaks apparently causing allelopathic or other adverse effects on indigenous flora. (Other oak species that have been investigated overseas are known to be allelopathic, i.e. toxic to other plants.)	Native vegetation	Moderate ?	Current
Eucalypt dieback disease.	Trees; Eucalypt-dependent fauna	Moderate	Current
Red Wattlebirds, Noisy Miners or Rainbow Lorikeets chasing away smaller, insect-eating bird species.	Birds; Tree health	Low to moderate	Current
Predation by foxes and cats.	Birds, lizards	Unknown	Current

Priority actions

1. The main threat to the native vegetation is from Large Quaking-grass, *Briza maxima*. A trial area of up to 50 m² should be treated with grass-specific herbicide at the lowest on-label rate for annual grasses. This should be done when the largest *Briza maxima* plants have five leaves, which is typically in late July or early August. This technique has worked well using Fusilade[®] herbicide on *Briza maxima* in Dandenong Valley Parklands. The location of the trial should be within the scenes of the photographs on page 222. The trial could be conveniently done in conjunction with the similar trial recommended for Ryburne Avenue Reserve (Site 24). This task is **urgent and high priority** in the context of the whole municipality.
2. Apply a non-residual, broad-spectrum herbicide to the weedy area of approximately 40m² in the middle-distance of Photo 2, whose location is marked on the aerial photograph on page 208. Apply mulch and revegetation to this patch. Until this can be done, cut the weeds down as often as necessary to control their seed production. The priority and urgency are moderate.
3. Spray the patch of *Juncus capillaceus* just above the steps from the oval. The priority and urgency are moderate.
4. If the historical and cultural importance of the four oaks within the site is low, remove one (preferably the second one from the north) and see if the indigenous ground flora is able to recover over a period of about five years. The priority is moderate and the urgency is low.

Past management and revegetation

As explained above, most of the area within this site's boundaries was regularly mown until recent years. Natural regeneration has been allowed to occur and Council has planted indigenous tubestock within the regenerating area, particularly on the oval embankment. Two of the species selected – *Melicytus dentatus* and *Olearia ramulosa* – are not ecologically appropriate in Plains Grassy Woodland. Council has also created revegetation beds in the north of the site, beside a track that provides access from High St to the oval for management vehicles.

Future revegetation

It would be desirable to increase the numbers of some plant species to make viable populations. This would have to be done with care to select plants from the nearest practicable areas of Plains Grassy Woodland in the Gippsland Plains bioregion. In the case of *Austrodanthonia carphoides*, all seed should come from the site itself. (The author has already provided some to the Council.) The other affected species are *Arthropodium strictum*, *Convolvulus angustissimus*, *Hardenbergia violacea* and *Pimelea curviflora*. All of these except the *Hardenbergia* grow beside the nearby Alamein railway line in Site 30 (or just to its north, in the case of the *Convolvulus*).

Depending on the source of seed for these species, an exchange of seed may be of benefit to the ecology of both sites.

The prickly branches of *Acacia paradoxa* make this species useful for creating bird habitat in such a site, with the added benefit of bright golden flowers. *Bursaria spinosa* would be similarly useful.

Because of the importance of the endangered Plains Grassy Woodland EVC, species selected for future revegetation should be confined to those that belong in this EVC. Guidance can be found in Appendix C.

Records should be kept of any planting done in this (or any other) site, including species, numbers and locations.

Monitoring

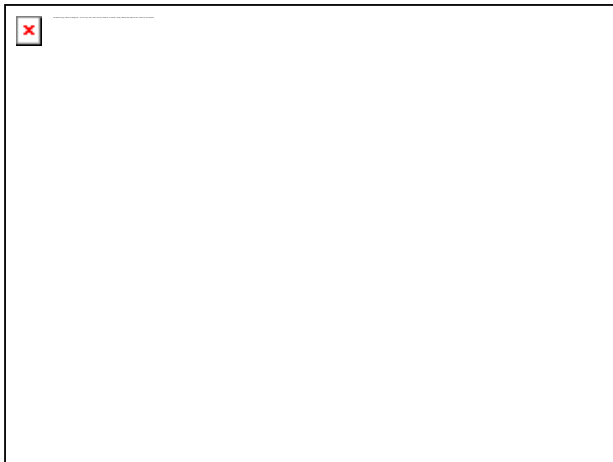
This study found no pre-existing data suitable for ecological monitoring.

The following items have been gathered to provide additional data for future monitoring:

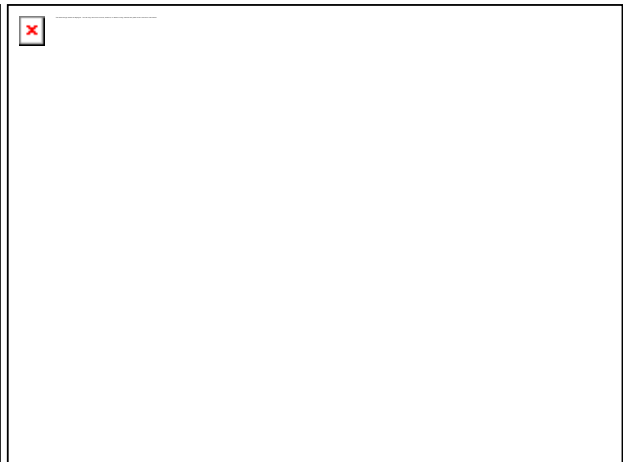
- The two photographs presented below, which are for monitoring efforts to control Large Quaking-grass (*Briza maxima*). Repeat these scenes shortly after control efforts and in November or December of at least two subsequent years;
- The flora list for the site, as provided beneath the heading 'Full flora list' above. Repeat in spring every two to four years. Check for changes in the species present or their abundances;
- The habitat score determination, whose original field data sheets are available separately. Repeat every two to four years. Check for changes in the various components of the habitat score.

Monitoring photographs for Eric Raven Reserve, taken on 25th November, 2004

The locations and orientations of the photographs are shown on the aerial photograph on page 217.



Site 22, Photo 1. A scene on the slope next to High St, beside a remnant River Red Gum, to show the density of the serious weed, Large Quaking Grass. The camera is above a track parallel to High St.



Site 22, Photo 2. A view to the north-northeast with the camera positioned on the third bollard from the south. This photograph is again to show the density of Large Quaking-grass.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of seven hours and fifteen minutes on 11th and 25th November 2004, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species, including the indigenous species' abundances and the threat level of all weed species in each area;
 - Mapping, counting and recording populations of plant species that are rare or threatened in the site or more generally;
 - Habitat scoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- The report by Quin D.G., Cook S. and McMahon J. (2004): '*Gardiners Creek Water Rat* *Hydromys chrysogaster Survey*'. Report from Ecology Australia to Melbourne Water. iv + 30 pp + data spreadsheet;
- Information from the Department of Sustainability & Environment's flora and fauna databases;
- The Department of Sustainability & Environment's BioMaps of the area;
- Aerial photography from August 2004;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

No further investigation is recommended here, other than the monitoring proposed above.

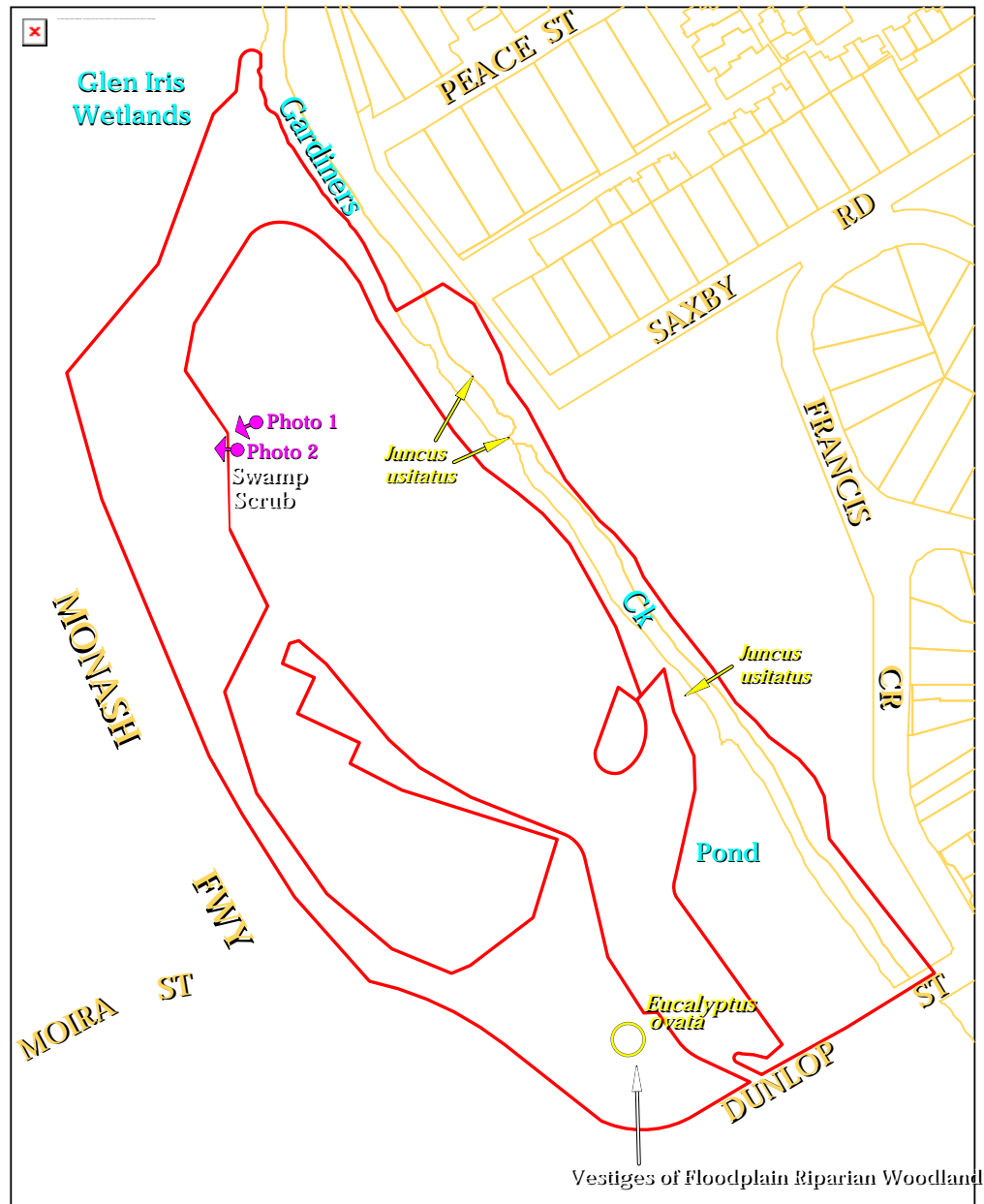
Site 23. Dorothy Laver Reserve, Glen Iris

Creek, pond, bushland remnants and revegetation distributed around a recreation reserve. Melway ref. 59 K10.

Site Biological Significance Level: *Local*

Summary of significant natural assets:

- The only representation in Boroondara of the endangered Ecological Vegetation Class, Swamp Scrub, but small in extent and badly degraded;
- Viable populations of two plant species and one bird species that are threatened in Boroondara;
- One large old tree, belonging to the locally endangered species, Swamp Gum (*Eucalyptus ovata*);
- The site is a node on the wildlife corridor of Gardiners Creek.



Scale 1:3,000
10 0 20 40 60 80 100 m

Boundaries

The site is outlined in red on the aerial photograph. It extends as far as the municipal boundary in the west, northwest and beside Dunlop St, and if this study were not constrained to Boroondara, the Glen Iris Wetlands (in Stonnington) would have been included. The bed and banks of Gardiners Creek upstream and downstream of this site are within Site 19.

Land use & tenure

Public park and recreation reserve, managed by the City of Boroondara.

Physical features

Site area: 3.9 hectares

Elevation: The normal water level of Gardiners Creek and Back Creek is at an elevation of approximately 16 m. The floodplain elevation is typically 3 m higher and the freeway is several metres higher again.

Landform: Floodplain with artificially created streambed, pond, drain and road embankments.

Slope: The floodplain is almost flat. There are steep slopes (artificially created) on most of the riverbank and the embankment along the southern and southwestern edges.

Soil type: Alluvium – Brown sandy loam.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek Formation, exposed in the bed of Gardiners Creek as pale orange to whitish sandstone or siltstone.

Site description

The biological significance of this site relates to a small amount of natural vegetation, a larger amount of indigenous revegetation and the stream with its pond.

Tiny patches of highly degraded natural vegetation occur within the two white outlines on the aerial photograph. The more northerly of these has a dense canopy of remnant (*Melaleuca ericifolia*), with an understorey of weeds and planted indigenous species (with two *Carex appressa* plants that may be natural). In nature, a dense canopy of Swamp Paperbark indicates the endangered Ecological Vegetation Class (EVC) called Swamp Scrub, but in this case it is probably the result of partial regrowth of Floodplain Riparian Woodland (another endangered EVC) after clearing long ago. No pre-European stands of Swamp Scrub are known to persist in Boroondara today.

The only indigenous plants in the more southerly remnant of natural vegetation, labelled ‘vestiges of Floodplain Riparian Woodland’ on the aerial photograph, are a single eucalypt and a small cluster of Black Wattles (*Acacia mearnsii*). The eucalypt is significant because it is a large Swamp Gum (*Eucalyptus ovata*), which is an endangered species in Boroondara.

Most of the other naturally occurring indigenous plants in the reserve are amphibious species at the water’s edge along the creek and pond. Amphibious species are naturally adapted to great ecological disturbance (in order to survive floods), so they have suffered less than other species from the massive earthworks that have occurred.

The route of Gardiners Creek through Dorothy Laver Reserve was straightened by the 1970s. The 1980s saw the construction of the pond and the Monash Freeway, as well as revegetation on the embankment beside the freeway and Dunlop St. There has been additional revegetation in recent years near the Dunlop St bridge and around the two ovals that lie west of the creek.

Some of the River Red Gums that have been planted have reproduced. This is important because in Boroondara (as in many other areas), revegetation plants have rarely shown signs of reproducing and hence becoming self-sustaining. The other clear benefit of the revegetation being so mature is that it is harbouring small birds such as Superb Fairy-wrens, which are extremely rare in this district.

The pond is very popular with visitors. It, and food provided by visitors, attract many waterbirds – mostly common native species, but also domestic geese and hybrids between Pacific Black Ducks and Mallards.

Ecological links with other land

Dorothy Laver Reserve is on the Gardiners Creek ecological corridor. Waterbirds, fish and other aquatic fauna move along the creek upstream and downstream of the site defined here. Seeds of some amphibious plants, particularly species of *Juncus* and *Persicaria*, would also move along the creek, mainly downstream, into and out of the reserve.

Other plant species would exchange pollen and seeds between Dorothy Laver Reserve and nearby native vegetation, including the adjacent Glen Iris Wetlands and along Gardiners Creek. Waterbirds and frogs are also likely to move between the reserve and the Glen Iris Wetlands.

Some small birds such as the Superb Fairy-wrens seen in the reserve need more habitat than the reserve can offer. They are presumed to move between the reserve, the adjacent Glen Iris Wetlands area, and riparian habitat along Gardiners Creek. The Brown Thornbill is likely to make use also of nearby residential gardens, as are hardy urban birds such as the Australian Magpie and Magpie-lark.

Habitat types

Perennial Stream (No EVC number).

Gardiners Creek and the associated pond provide habitat for fish and other aquatic fauna. Submerged plants were not detected but may be present. The streambed and the pond are both artificially excavated.

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion).

Represented by scattered plants along Gardiners Creek, as well as the tiny remnant (0.05 hectares) near Dunlop St, outlined in white on the aerial photograph on p. 224.

Canopy trees: Reduced to one large old *Eucalyptus ovata*. A remnant *Eucalyptus camaldulensis* beside the car park near the *Eucalyptus ovata* had been cut down shortly before this study's site inspection on 31st March 2005.

Lower trees: *Acacia mearnsii* is fairly dense near Dunlop St and there are patches of *Melaleuca ericifolia* along Gardiners Creek. The weed, *Fraxinus angustifolia*, is abundant along Gardiners Creek.

Shrubs: None.

Vines: There are no indigenous vines, but the weed, *Salpichroa origanifolia*, is abundant in places.

Ferns: None.

Ground flora: Beside the creek and pond, there is an abundance of *Persicaria hydropiper*, *Juncus gregiflorus* and *Juncus sarophorus*, as well as scattered *Epilobium hirtigerum*, *Juncus amabilis*, *Juncus usitatus*, *Phragmites australis* and *Persicaria decipiens*. The ground flora of the patch around the *Eucalyptus ovata* is entirely exotic, dominated by *Ehrharta erecta* and also with large numbers of *Brassica fruticulosa*.

Swamp Scrub (EVC 53, **endangered** in the Gippsland Plain bioregion)

The only remnants of Swamp Scrub are a dense canopy of *Melaleuca ericifolia* and possibly two *Carex appressa* plants (which may conceivably have been planted). These lie within the more northerly white outline on the aerial photograph, measuring 0.09 hectares. This area probably supported Floodplain Riparian Woodland prior to clearing long ago, and only the hardiest species have regenerated to form what is treated here as Swamp Scrub.

Canopy trees: A pure, dense stand of *Melaleuca ericifolia*. Some *Eucalyptus camaldulensis* have been planted recently. The pre-settlement vegetation probably included an open canopy of *Eucalyptus camaldulensis* and *Eucalyptus ovata*.

Lower trees: None.

Shrubs: A small number of *Gynatrix pulchella* and *Pomaderris racemosa* have been planted. The natural shrub layer would comprise scattered *Coprosma quadrifida*.

Vines, ferns: None. The natural state would include scattered *Cyathea australis*, *Blechnum minus* and *Polystichum proliferum*.

Ground flora: The only plants that may be remnants of pre-settlement vegetation are two *Carex appressa* tussocks. The ground flora is now dominated variously by the serious weeds, *Ehrharta erecta* or *Tradescantia fluminensis*. There is also an abundance of the serious weed, *Galium aparine*, and of the less serious weed, *Solanum nigrum*. The eastern edge of the patch has been recently planted with *Chrysocephalum semipapposum*, *Juncus amabilis* and *Lomandra longifolia*, of which the *Chrysocephalum* is unlikely to have been an indigenous species in the pre-settlement vegetation.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (i.e. vulnerable and endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Notes
Melbourne	Boroondara		
Rare or threatened	Vulnerable	<i>Juncus usitatus</i>	Three were found beside the creek.
	Endangered	<i>Eucalyptus ovata</i>	A single, large old tree, in fair health.
	Vulnerable	<i>Phragmites australis</i>	Secure beside Gardiners Creek.

Full flora list

The following table includes all species of indigenous plants (naturally occurring and planted) and weeds found at Dorothy Laver Reserve by the author on 31/3/05. Species names prefixed with an obelisk (†) may be planted or natural. Each species' spatial distribution has been subdivided into five columns numbered as follows:

- Area 1 = beside the creek or pond;
 Area 2 = Swamp Scrub;
 Area 3 = the southern patch outlined in white on the aerial photograph;
 Area 4 = mature revegetation beside the freeway and Dunlop St; and
 Area 5 = other revegetation areas.

In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Species with underlined names represent good resources for collection of seed or cuttings. Some planted species may not be listed.

Species Name	Area					Species Name	Area					Species Name	Area											
	1	2	3	4	5		1	2	3	4	5		1	2	3	4	5							
Indigenous species (not planted)						Environmental weeds																		
<i>Acacia mearnsii</i>			D			<i>Callistemon sieberi</i>				✓		<i>Allium triquetrum</i>		✓				<i>Araujia sericifera</i>	-					
† <i>Bursaria spinosa</i>				✓	✓	<i>Coprosma quadrifida</i>				-		<i>Brassica fruticulosa</i>			M	M		<i>Bromus catharticus</i>					✓	
† <i>Carex appressa</i>		-				<i>Eucalyptus camaldulensis</i>		✓		✓	✓	<i>Cynoda sumatrensis</i>					✓	<i>Cynodon dactylon</i>					✓	
<i>Cassinia arcuata</i>				-		<i>Eucalyptus melliodora</i>				✓	-	<i>Ehrharta erecta</i>			D	D	D	D	<i>Ehrharta longiflora</i>			✓		
<i>Epilobium hirtigerum</i>	✓					<i>Goodenia ovata</i>				-		<i>Foeniculum vulgare</i>			-	-		<i>Fraxinus angustifolia</i>	M			M	✓	
<i>Eucalyptus camaldulensis</i> (dead)			-			<i>Gynatrix pulchella</i>		✓				<i>Fumaria sp.</i>			-			<i>Galium aparine</i>			M			
<i>Eucalyptus ovata</i>			-			<i>Indigofera australis</i>				-		<i>Hedera helix</i>			✓			<i>Helminthotheca echioides</i>				-		
<i>Juncus amabilis</i>	-					<i>Juncus amabilis</i>		✓				<i>Helminthotheca echioides</i>				-		<i>Paspalum distichum</i>	✓					
<i>Juncus gregiflorus</i>	✓					<i>Juncus pallidus</i>				-		<i>Pennisetum clandestinum</i>	D			✓		<i>Persicaria maculosa</i>	-					
<i>Juncus sarophorus</i>	✓					<i>Kunzea ericoides</i> s.l.				M	M	<i>Phalaris aquatica</i>	-					<i>Pinus radiata</i>					-	
† <i>Juncus subsecundus</i>	-					<i>Leptospermum lanigerum</i>				✓	✓	<i>Pittosporum undulatum</i>	-		-	✓		<i>Prunus cerasifera</i>						
<i>Juncus usitatus</i>	-					<i>Lomandra longifolia</i>		✓		✓	✓	<i>Plantago lanceolata</i>			✓			<i>Quercus robur</i>			✓			
<i>Lachnagrostis filiformis</i>				-		<i>Melaleuca ericifolia</i>				✓	✓	<i>Rubus ?anglocandicans</i>						<i>Rumex crispus</i>						
<u><i>Melaleuca ericifolia</i></u>	M	D				<i>Melicytus dentatus</i>				-		<i>Salix babylonica</i> s.l.						<i>Salpichroa organifolia</i>	✓	✓	M	✓		
<u><i>Persicaria decipiens</i></u>	✓					<i>Poa labillardierei</i>				✓	✓	<i>Solanum nigrum</i>			M	M		<i>Sonchus oleraceus</i>			-			
<u><i>Persicaria hydropiper</i></u>	M					<i>Viminaria juncea</i>				✓	✓	<i>Tradescantia fluminensis</i>	-	D				<i>Vinca major</i>	✓					
<i>Phragmites australis</i>	✓					Non-indigenous species (planted)						<i>Zantedeschia aethiopia</i>	-											
<i>Portulaca oleracea</i>				✓		<i>Chrysocephalum semi-papposum</i>		✓																
Indigenous species (planted)						<i>Correa glabra</i>					-													
<i>Acacia acinacea</i>					-	<i>Dodonaea viscosa</i>				-	✓													
<i>Acacia dealbata</i>				✓		<i>Eucalyptus goniocalyx</i>				-														
<i>Acacia implexa</i>				✓	✓	<i>Eucalyptus leucoxylon</i>					M													
<i>Acacia mearnsii</i>					✓	<i>Eucalyptus polyanthemos</i>					✓													
<i>Acacia melanoxylon</i>				✓	✓	<i>Eucalyptus sideroxylon</i>					✓													
<i>Acacia paradoxa</i>				-	-	<i>Eucalyptus sp.</i>					✓	✓												
<i>Acacia pycnantha</i>				✓		<i>Ficinia nodosa</i>		-																
<i>Acaena novae-zelandiae</i>				-		<i>Leptospermum scoparium</i>				-														
<i>Allocasuarina littoralis</i>				-	✓	<i>Melaleuca armillaris</i>				-														
<i>Allocasuarina verticillata</i>					-	<i>Myoporum sp. 1</i>				✓	✓													
<i>Austrodanthonia racemosa</i>					✓	<i>Pomaderris aspera</i>					✓													
<i>Austrodanthonia setacea</i>					✓	<i>Pomaderris racemosa</i>				✓														
<i>Bursaria spinosa</i>					✓	<i>Quercus robur</i>	✓																	

Large old tree

The *Eucalyptus ovata* in the site's southern corner, marked on the aerial photograph on page 224, has a trunk diameter of 85 cm and therefore qualifies as a 'large old tree' under the definition adopted by the Department of Sustainability & Environment for Floodplain Riparian Woodland. It is in fair condition.

Fauna of special significance

Only one significant fauna species was observed during the brief inspection of Dorothy Laver Reserve, as shown below. The conservation status rating, 'vulnerable', is explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Last Record	Notes
Vulnerable	Superb Fairy-wren	2005	One (or perhaps two) families were observed foraging behind the oval pavilion and near the Glen Iris Wetlands.

Full fauna list

The following list was compiled during the author's brief (2½ hours) ecological assessment of the reserve. Asterisks indicate introduced species. The list is bound to be incomplete, particularly in the case of fishes because migratory species found upstream (e.g. Shortfin Eel and Common Galaxias) must move through this site. The Flatheaded Gudgeon is also quite possibly present. Frogs such as the Common Froglet are also likely to be present, at least sometimes.

Butterflies

*Cabbage White
Common Brown
Common Grass-blue
Yellow-banded Dart

Fish

*Carp
*Mosquitofish

Birds

Domestic Goose
Pacific Black Duck
*Mallard×Black Duck
Chestnut Teal
Dusky Moorhen
Eurasian Coot
*Spotted Turtle-Dove

Superb Fairy-wren
Brown Thornbill
Noisy Miner
White-plumed Honeyeater
Magpie-lark
Willie Wagtail
Australian Magpie

Pied Currawong
Welcome Swallow
*Common Blackbird
*Common Starling
*Common Myna

Fauna habitat

The revegetation and the Swamp Scrub provide food for the Superb Fairy-wren and Brown Thornbill. A large *Eucalyptus botryoides* next to Saxby Rd (just outside the site defined here) has hollows that may house native fauna. The electricity transmission pylon is probably used as a vantage point (and perhaps a nest site) for raptors such as the Australian Hobby. The pond is popular with all the waterbirds listed above. The creek and pond also provide habitat for aquatic organisms from microbes to fish. The grassy slope adjacent to Dunlop St represents suitable habitat for the butterflies listed above.

Site significance ratings

The following is an assessment of the site against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

This site approximately fits the description in BioSites criterion 1.2.6 of 'Corridor or component of 'stepping stones' (includes riparian corridor...) ...important at Local scale', thereby qualifying for **Local** significance.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), degraded native vegetation belonging to an endangered EVC (such as both EVCs present at Dorothy Laver Reserve) has a conservation significance rating of High.

According to BioSites criterion 3.2.3, State significance applies to any site with a 'remnant patch' whose conservation significance is High or Very High due to the presence of a threatened EVC. This does not apply to Dorothy Laver Reserve because there is too small an area of native vegetation to qualify as a remnant patch. In this circumstance, the BioSites criteria recognise no significance at all.

Rare or threatened plants

The reserve's populations of the locally threatened species, *Juncus usitatus* and *Phragmites australis* are apparently ecologically viable, taking into account reproductive connections with other plants further upstream and downstream. A site with any viable population of a locally threatened species is of **Local** significance according to BioSites criterion 3.1.5. The solitary specimen of *Eucalyptus ovata* does not represent a viable population.

Rare or threatened fauna

The reserve's population of the locally threatened Superb Fairy-wren is quite possibly ecologically viable (and should be regarded as such until further investigation can occur). As for flora, any site with a viable population of a locally threatened fauna species is of **Local** significance according to BioSites criterion 3.1.5.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Panic Veldt-grass (<i>Ehrharta erecta</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Cleavers (<i>Galium aparine</i>), Ivy (<i>Hedera helix</i>), Water Couch (<i>Paspalum distichum</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Wandering Jew (<i>Tradescantia fluminensis</i>); • Moderately serious: Angled Onion (<i>Allium triquetrum</i>), White Bladder-flower (<i>Araujia sericifera</i>), Twiggy Turnip (<i>Brassica fruticulosa</i>), Prairie Grass (<i>Bromus catharticus</i>), Couch (<i>Cynodon dactylon</i>), Fennel (<i>Foeniculum vulgare</i>), Desert Ash (<i>Fraxinus angustifolia</i>), unidentified fumitory (<i>Fumaria</i> sp.), Toowoomba Canary-grass (<i>Phalaris aquatica</i>), Monterey Pine (<i>Pinus radiata</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Ribwort (<i>Plantago lanceolata</i>), Cherry-plum (<i>Prunus cerasifera</i>), English Oak (<i>Quercus robur</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Pampas Lily-of-the-Valley (<i>Salpichroa origanifolia</i>), Black Nightshade (<i>Solanum nigrum</i>), Blue Periwinkle (<i>Vinca major</i>), White Arum Lily (<i>Zantedeschia aethiopica</i>). 	All	High	Current
Predation by foxes and cats.	Birds, particularly Superb Fairy-wrens	High to Moderate	Current
Eucalypt dieback disease.	Trees; Eucalypt-dependent fauna	Moderate	Current
Hybridisation between Pacific Black Ducks and Mallards.	Ducks	Low	Current
Water contamination by bread fed to waterbirds in the pond.	Aquatic life	Low	Current
Road kill, mainly on the Monash Freeway	Birds	Unknown	Current

Priority actions

1. The priority of weed control in the Swamp Scrub should be raised, and carefully selected indigenous species should be planted there (see below). *Tradescantia fluminensis* can be removed by hand or weed burner and *Ehrharta erecta* is susceptible to grass-specific herbicide. Fusilade[®] is widely used for *Ehrharta erecta* near aquatic environments in Western Australia and to a lesser degree around Melbourne, and it is claimed to have low aquatic toxicity. *Galium aparine* is the other main weed in the Swamp Scrub, which can be dealt with manually or chemically (again with care to avoid ecological toxicity to this swampy environment, e.g. to frogs).
2. Seek expert arboricultural advice about how to improve the health of the *Eucalyptus ovata* marked on the aerial photograph on page 224. Mulching around it would probably help.

Past management and revegetation

Most of the native vegetation management in Dorothy Laver Reserve has been revegetation, from the 1980s to the 2000s. Shrubs and trees have grown very well, but the ground flora is very weedy in the older revegetation areas. Planting of indigenous species has also occurred in the Swamp Scrub patch (mainly on the eastern edge), but the species selected have not all been ideal.

Future revegetation

Because the area of Swamp Scrub is unique in Boroondara, it is worthy of a reasonable level of effort to rehabilitate it. This would require weed control (priority action 1 above) and some revegetation.

A critical feature of healthy Swamp Scrub is the dense shade created by its canopy. However, the narrowness of the patch at Dorothy Laver Reserve, and the paucity of shady trees or shrubs to its east and west, allows too much light into parts of the scrub to allow proper ecological functioning. In particular, weeds are thriving where extra sunlight penetrates. It would

therefore be desirable to plant a few dense, shady shrubs or small trees on the margins where suckering paperbarks are not already providing enough shade. *Acacia melanoxylon* and *Gynatrix pulchella* would be suitable species for this purpose.

Within the Swamp Scrub, it would be desirable to plant approximately 15 each of *Coprosma quadrifida*, *Goodenia ovata*, *Juncus amabilis* and *Senecio minimus*, optionally with a few ferns selected from *Blechnum minus*, *Cyathea australis* and *Polystichum proliferum*. Weeds would have to be reduced before the planting, at least in niches surrounding the individual planting holes. If weeds eventually stabilise at a fairly low density, the characteristic low species *Isolepis inundata*, *Lobelia anceps* and *Centella cordifolia* could be planted.

Some of the revegetation beside the Monash Freeway and Dunlop St has matured to such a stage that shrubs could be planted beneath the trees. Species such as *Acacia paradox* and *Bursaria spinosa* would improve the habitat for the Superb Fairy-wrens.

Any of the plantings suggested above could be accompanied by a sign showing a Superb Fairy-wren and a statement that the plantings will assist the survival of this endearing, locally threatened bird species.

Monitoring

This study found no pre-existing data suitable for ecological monitoring.

The following items have been gathered to provide data for future monitoring:

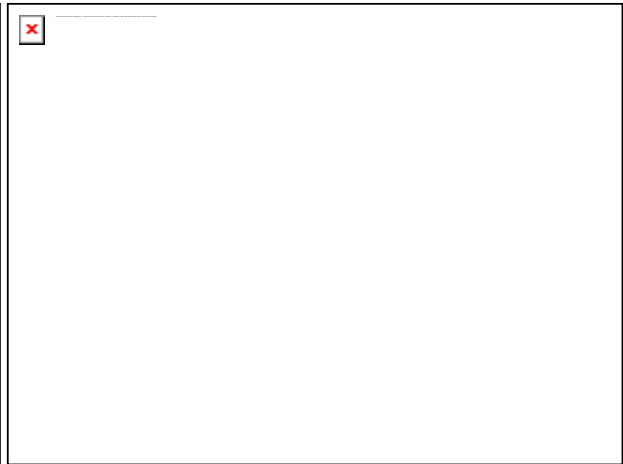
- The two photographs presented below, which are for monitoring the density of the Swamp scrub's canopy and ground flora weeds;
- The flora list for five parts of the site, as provided beneath the heading 'Full flora list' above. Repeat every two to four years. Check for changes in the species present or their abundances;
- Population counts of scarce plant species: 2 *Carex appressa* in the Swamp Scrub, 2 *Cassinia arcuata* below the freeway and 3 *Juncus usitatus* as marked on the aerial photograph;
- Ratings of weed severity, as listed under the heading 'Threats' above;
- The observation that the health of the *Eucalyptus ovata* is fair, as mentioned above and stored in the geographic information system data from this study.

Monitoring photographs for Dorothy Laver Reserve, taken on 31st March, 2005

The locations and orientations of the photographs are shown on the aerial photograph on page 224.



Site 23, Photo 1. A view of the northern end of the Swamp Scrub from the oval, to show the density of the *Melaleucas* at different heights within the canopy.



Site 23, Photo 2. The eastern edge of Swamp Scrub, approximately 8m south of where it intrudes closest to the centre of the adjacent oval. The purpose is to show the plantings, mulch and weeds in the background.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a 2½ hours on 31st March 2005, using this study's standard approach described in Section 2.3. This included:
 - Mapping of areas with different types of vegetation;
 - Compilation of lists of indigenous and introduced plant species within each of the abovementioned areas, including the species' abundances and the threat level of all weed species;
 - Mapping, counting and recording populations of plant species that are rare or threatened in the site or more generally;

- Measurement and health assessment of the large old *Eucalyptus ovata*;
- Incidental fauna observations; and
- Checks for fauna habitat, ecological threats and management issues;
- The Department of Sustainability & Environment's BioMaps of the area;
- Aerial photography from August 2004;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

As noted in 'priority action 2', an arborist's assistance should be sought about conserving the solitary *Eucalyptus ovata*.

It would be useful to compile a more complete list of fauna over at least one year of occasional visits. Attention should be focused on determining the population size and movement of the Superb Fairy-wrens. Ideally, fish would be surveyed in the pond (e.g. seeking Flatheaded Gudgeon), without harming any native fish. A volunteer may be prepared to help, at least in the case of birds. A 'wanted' advertisement at the park or in newsletters of the associated sporting clubs may elicit a volunteer. Frogs could be surveyed in conjunction with the Melbourne Water Frog Census during autumn and spring, and Council or Melbourne Water may be able to direct a volunteer to the reserve.

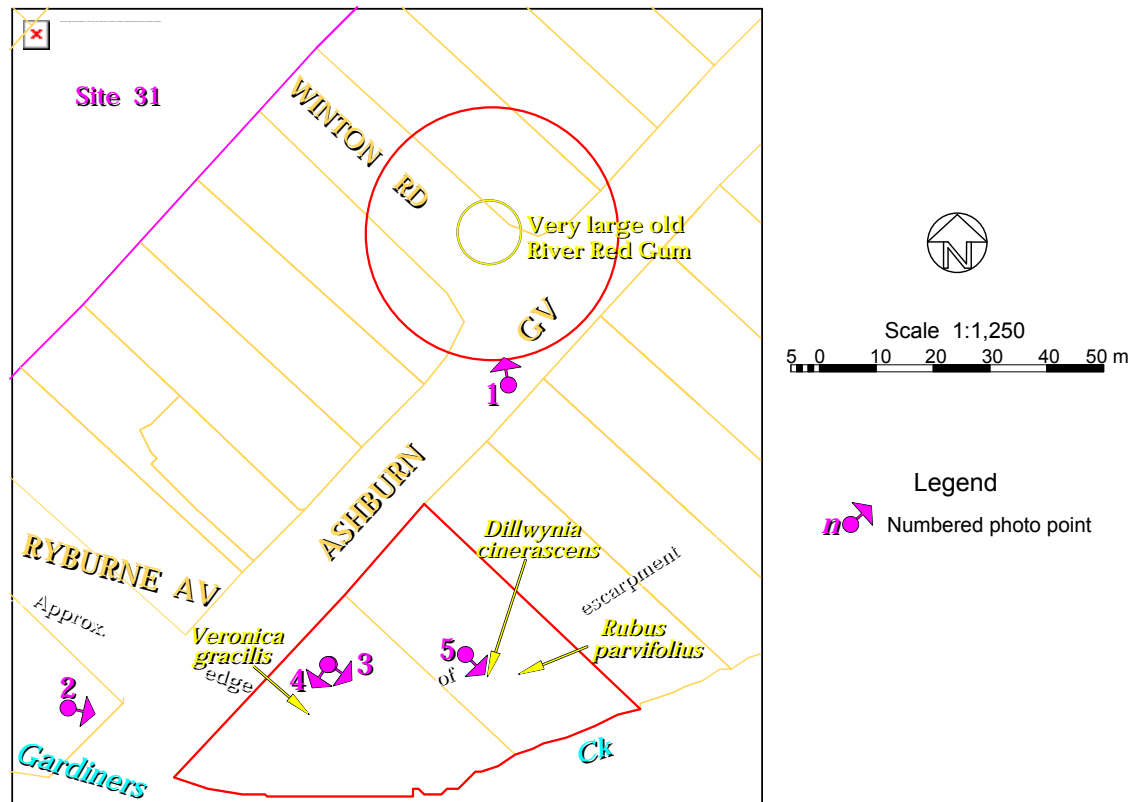
Site 24. Ryburne Avenue Reserve & Neighbouring Tree

Small riverbank reserve with informal paths through weedy bushland, plus a neighbouring large old River Red Gum. Melway ref. 69 C1.

Site Biological Significance Level: *Local*

Summary of significant natural assets:

- One very large old River Red Gum tree in good condition at the corner of Ashburn Grove and Winton Rd;
- Tiny areas of two endangered Ecological Vegetation Classes: Riparian Woodland and Escarpment Shrubland;
- Viable populations of two plant species that are threatened in Boroondara, and less secure populations of seven other locally threatened plant species (one of which – *Dillwynia cinerascens* – is unique in Boroondara);
- The site is a small node on the ecological corridor of Gardiners Creek.



Boundaries

This site comprises two parts, each outlined in red above. The approximately triangular area beside Gardiners Creek is a council reserve comprising two allotments. The circle to the north is a Tree Protection Zone of radius 22.2 m centred on a large River Red Gum. This radius is 18 times the trunk diameter of the River Red Gum at its centre, based on the recommendations of Matheny and Clark (1998) for over-mature trees that are sensitive to root disturbance. The two areas are grouped here into a single site for convenience because of their proximity to each other.

Land use & tenure

The southern section is an undeveloped public reserve, managed by the City of Boroondara and Melbourne Water, with powerlines traversing it. The circular section spans road reserve and parts of three houses and residential properties.

Physical features

Site area: 0.21 hectares in the reserve; 0.15 hectares within the circle around the very large River Red Gum.

Elevation: Gardiners Creek's normal water level is at an elevation of approximately 22 m. The highest point in the reserve (beside Ashburn Grove) has an elevation of 36 m. The large old River Red Gum at the centre of the northern

section of this site is at an elevation of 39 m.

Landform: Stream escarpment with gentle slope above.

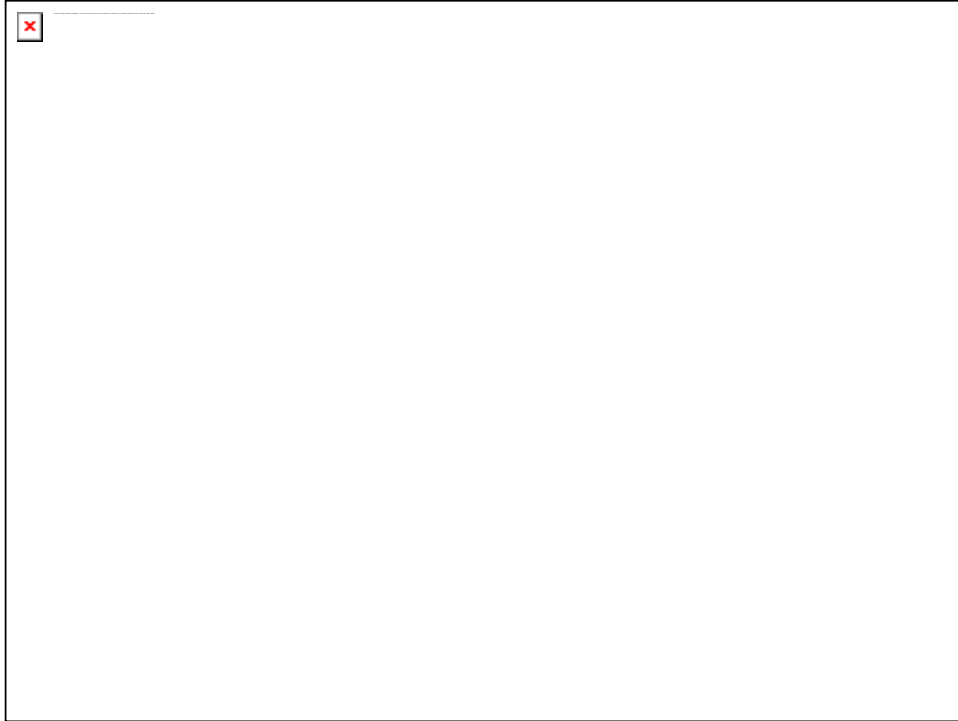
Slope: Parts of the riverbank are extremely steep (approaching vertical), tapering to typically 1:9 at Ashburn Grove.

Soil type: Light grey loam with clay subsoil.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek Formation, well exposed on the riverbank as pale orange to whitish siltstone or sandstone.

Site description – Large River Red Gum

The tree at the centre of the circular section of this site, at the corner of Ashburn Grove and Winton Rd, is an impressive specimen of River Red Gum (*Eucalyptus camaldulensis*), as depicted below.



Site 24, Photo 1. The very large River Red Gum at the corner of Ashburn Grove and Winton Rd, on 21/2/05.

This tree has a broad enough trunk to qualify as a ‘very large old tree’ under the definition adopted by the Department of Sustainability & Environment for Plains Grassy Woodland (of which the tree was once a part). It is approximately 20 m tall and its trunk diameter is 1.24 m, making it well over a century old (and possibly as much as several centuries old). It is in good health.

Site description – Ryburne Avenue Reserve

Ryburne Avenue Reserve has a gently sloping section and a steeply sloping riverbank escarpment, delineated approximately by the dashed white curve on the aerial photograph on page 232.

The lowest part of the riverbank is within the channel of Gardiners Creek and experiences periodic inundation. It has some terracing and very steep surfaces, with substantial outcropping of bedrock exposed by floods. There are dense patches of Swamp Paperbark (*Melaleuca ericifolia*). There are also numerous plants of *Poa labillardierei*, the best natural (or apparently natural) population of this locally vulnerable species in Boroondara outside Yarra Bend Park. The vegetation in this narrow strip belongs to the Ecological Vegetation Class called Riparian Woodland.

Above the Riparian Woodland, the escarpment is less steep and supports more trees, particularly Yellow Box (*Eucalyptus melliodora*) and Black Wattle (*Acacia mearnsii*). Among these is Boroondara’s only plant of the attractive species, Grey Parrot-pea (*Dillwynia cinerascens*), surrounded by dumped garden waste and rubble. The author also found a dead Red Stringybark (*Eucalyptus macrorhyncha*) – the only record ever of this species in Boroondara – and a dead Cherry Ballart (*Exocarpos cupressiformis*), representing the recent loss of two significant plant species from the reserve. There are several other locally threatened plant species represented by only one individual, making the site’s biological significance at considerable threat from precariously small plant populations. Unfortunately, the threats are greatly heightened by severe weed problems and rubbish dumping by a neighbour.

Melbourne Water organised planting in the upper part of the escarpment in 2001 or 2002. The intention was evidently to include species belonging to the Escarpment Shrubland (Ecological Vegetation Class 895) that occurs there, but at least one of the species selected, *Dodonaea viscosa*, does not belong to the local form of Escarpment Shrubland.

A large proportion of the gently sloping area north of the escarpment has been cleared to provide space for powerlines. It is now mown regularly and some of it functions as an extension to an adjacent garden. The southeastern limit of the mowing seems to be encroaching slowly into the native vegetation, and garden waste is being dumped into the Escarpment Shrubland from the edge of the mown area.

Ecological links with other land

This site represents a small node of native vegetation on the Gardiners Creek ecological corridor. It is so small that hardly any species of native flora or fauna could persist in isolation from other habitat. Waterbirds, fish and other aquatic fauna move along the creek upstream and downstream of the reserve. Some plant species, such as *Melaleuca ericifolia*, can readily exchange pollen and seeds between the site and nearby native vegetation, including along Gardiners Creek (Site 19) and along the Outer Circle Railway corridor (Site 31). The very large River Red Gum at the corner of Ashburn Grove and Winton Rd would be visited by some birds and insects moving between these sites.

Populations of several indigenous plant species in the reserve are reproductively disconnected from other populations (e.g. *Dillwynia cinerascens* and *Rubus parvifolius*), which is a serious threat to their long-term survival.

Habitat types

Riparian Woodland (EVC 641, **endangered** in the Gippsland Plain bioregion).

This EVC is represented in the reserve by a strip only a few metres wide within the channel of Gardiners Creek, subject to periodic inundation. The area measures approximately 200 m², with 8 indigenous plant species.

Canopy trees: There are some overhanging *Eucalyptus melliodora* from further up the escarpment, but no canopy trees grow within the narrow Riparian Woodland strip.

Lower trees: *Melaleuca ericifolia* forms dense copses.

Shrubs, vines and ferns: None.

Ground flora: The characteristic species *Lunularia cruciata* and *Poa labillardierei* are abundant. Other indigenous species are mostly in small numbers and concentrated near the water's edge, including *Juncus pauciflorus*, *Persicaria decipiens* and *Phragmites australis*. *Cotula australis* was growing at the base of some *Melaleuca* when the author visited, reflecting the brevity of inundations that occur in the Riparian Woodland.

Escarpment Shrubland (EVC 895, **endangered** in the Gippsland Plain bioregion) – topographically sheltered variant.

Approximately 700 m², comprising 19 indigenous plant species (two of them dead) and 27 introduced plant species in 2005.

Canopy trees: Dominated by adolescent *Eucalyptus melliodora*. There are also some sapling *Eucalyptus camaldulensis* that appear likely to have been planted, and a single, dead *Eucalyptus macrorhyncha*. Botanist Bruce Muir included no eucalypts on his 1980 list, suggesting that the existing eucalypts are either natural regrowth or have been planted. However, *Eucalyptus macrorhyncha* is a species rarely planted.

Lower trees: *Acacia mearnsii* is abundant and *Acacia melanoxylon* is also present. *Exocarpos cupressiformis* is represented by one individual that has recently died.

Shrubs: *Bursaria spinosa* is dense in the more natural areas. The somewhat herbaceous shrub, *Senecio hispidulus*, is extremely abundant, and *Goodenia ovata* is abundant. *Dodonaea viscosa*, *Gynatrix pulchella*, *Kunzea ericoides* and *Myoporum* sp. 1 ('petiolatum') have been planted. The declared noxious weeds, *Ulex europaeus* and *Genista monspessulana*, are abundant and represent a very serious threat to the reserve's natural values.

Vines: There is one *Rubus parvifolius*, growing among blackberries.

Ferns: None.

Ground flora: Heavily infested by weeds, particularly *Bromus diandrus*, *Dactylis glomerata* and *Oxalis pes-caprae*. The main indigenous species are *Austroanthonia racemosa*, *Austroanthonia setacea*, *Dianella admixta*, and *Lomandra longifolia*. There are single plants of *Dillwynia cinerascens*, *Pimelea humilis* and *Veronica gracilis*, and very few *Themeda triandra*. In 1980, Bruce Muir also recorded *Lepidosperma laterale*, *Lomandra filiformis* subsp. *coriacea* and *Schoenus apogon*.

Flora of special significance

The significant plant species below have been recorded at Ryburne Avenue Reserve, either by the author (dated 2004) or T. T. Bruce Muir (dated 1980). Muir's record of *Thelionema caespitosum* is omitted because it appears unreliable, for ecological reasons and because another blue-flowered lily, *Dianella admixta*, is abundant at the reserve and yet missing from Muir's list. Muir's record of *Dillwynia glaberrima* is a clear misidentification of the *Dillwynia cinerascens*, which

still grows in the reserve. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Last Record	Notes
Extinct	<i>Eucalyptus macrorhyncha</i>	2004	One tree, recently died, identifiable by its gumnuts.
Critically Endangered	<i>Dillwynia cinerascens</i>	2004	One individual (the only one in Boroondara), with garden waste and rubble dumped around it.
Critically Endangered	<i>Exocarpos cupressiformis</i>	2004	One tree, recently died.
Critically Endangered	<i>Pimelea humilis</i>	2004	Only one individual was found.
Critically Endangered	<i>Rubus parvifolius</i>	2004	Only one individual, surrounded by blackberry.
Endangered	<i>Lepidosperma laterale</i>	1980	No longer present.
Endangered	<i>Lomandra longifolia</i>	2004	Scarce.
Endangered	<i>Veronica gracilis</i>	2004	Only one patch was found.
Vulnerable	<i>Juncus pauciflorus</i>	2004	Numbers not recorded.
Vulnerable	<i>Phragmites australis</i>	2004	Covering a moderate area.
Vulnerable	<i>Poa labillardierei</i>	2004	Numerous.
Vulnerable	<i>Schoenus apogon</i>	1980	Likely to reappear from time to time.
Vulnerable	<i>Goodenia ovata</i>	2004	Numerous.

Full flora list

The following table includes all species of **indigenous** plants (naturally occurring and planted) recorded at Ryburne Avenue Reserve. Species names prefixed with an obelisk (†) were recorded by Bruce Muir in 1980 and the others were seen by the author in 2004-5. Some of the wattles appear natural and were recorded by Muir in 1980, but Janyce McMurtrie at the City of Boroondara advises that at least some are planted. The columns headed 'Lower' and 'Upper' correspond to the Riparian Woodland and the Escarpment Shrubland, respectively. In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Species with underlined names represent good resources for collection of seed or cuttings.

Species Name	Lower	Upper	Species Name	Lower	Upper	Species Name	Lower	Upper
Not planted			<i>Goodenia ovata</i>		M	† <i>Schoenus apogon</i>		
<i>Acacia mearnsii</i>		D	<i>Juncus pauciflorus</i>	✓		<u><i>Senecio hispidulus</i></u>		D
<i>Acacia melanoxydon</i>		✓	† <i>Lepidosperma laterale</i>			<i>Senecio quadridentatus</i>		✓
<i>Austrodanthonia racemosa</i>	✓	✓	† <i>Lomandra filiformis</i>			<i>Themeda triandra</i>		-
<i>Austrodanthonia setacea</i>		✓	<i>Lomandra longifolia</i>		✓	<i>Veronica gracilis</i>		-
<u><i>Bursaria spinosa</i></u>		D	<i>Lunularia cruciata</i>	✓		Planted		
<i>Cotula australis</i>	-		<i>Melaleuca ericifolia</i>	✓		<i>Eucalyptus camaldulensis</i>		✓
<u><i>Dianella admixta</i></u>		✓	<i>Pericaria decipiens</i>	✓		<i>Dodonaea viscosa</i>		✓
<u><i>Dillwynia cinerascens</i></u>		-	<i>Phragmites australis</i>	✓		<i>Gynatrix pulchella</i>		-
<i>Eucalyptus macrorhyncha</i>		-	<i>Pimelea humilis</i>		-	<i>Kunzea ericoides</i> s.l.		✓
<i>Eucalyptus melliodora</i>		D	<u><i>Poa labillardierei</i></u>		M	<i>Myoporum</i> sp. 1		✓
<i>Exocarpos cupressiformis</i>		-	<i>Rubus parvifolius</i>		-			

The table below lists all **weed** species found by the author in 2004-5 at Ryburne Avenue Reserve. The code letters in the 'Threat' column indicate the threat each species poses, as follows: 'V' = very serious; 's' = serious; and 'm' = moderate.

Species Name	Threat	Species Name	Threat	Species Name	Threat
<i>Allium triquetrum</i>	s	<i>Dactylis glomerata</i>	s	<i>Oxalis pes-caprae</i>	s
<i>Anthoxanthum odoratum</i>	s	<i>Ehrharta erecta</i>	m	<i>Pittosporum undulatum</i>	m
<i>Brassica ?fruticulosa</i>	m	<i>Foeniculum vulgare</i>	m	<i>Plantago lanceolata</i>	m
<i>Briza maxima</i>	m	<i>Fraxinus angustifolia</i>	s	<i>Prunus cerasifera</i>	m
<i>Bromus diandrus</i>	V	<i>Fumaria</i> sp.	m	<i>Rubus ?anglocandicans</i>	m
<i>Coprosma repens</i>	m	<i>Galium aparine</i>	m	<i>Salpichroa originifolia</i>	s
<i>Cotoneaster glaucophyllus</i>	m	<i>Genista monspessulana</i>	s	<i>Solanum nigrum</i>	m
<i>Cotoneaster pannosus</i>	m	<i>Lolium perenne</i>	m	<i>Ulex europaeus</i>	V
<i>Crataegus monogyna</i>	m	<i>Oxalis incarnata</i>	m	<i>Vicia sativa</i>	m

Fauna of special significance

The significant fauna species in the list below have been observed at Ryburne Avenue Reserve. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18). Another significant species, the Crested Pigeon, was seen by the author on the opposite side of the creek, and may occasionally forage in the reserve.

Conservation Status in Boroondara	Species Name	Last Record	Notes
Endangered	Water Rat or Rakali	2004	Trapped just downstream, and likely to make use of this site.
Endangered	Spotted Pardalote	1999	Also seen and heard a short distance upstream in 2004.
Vulnerable	Little Pied Cormorant	2001	Nomadic along the creek; Likely to be regular.
Vulnerable	White-faced Heron	1999	As for the two previous species.
Vulnerable	Eastern Rosella	2004	Resident along the creek, likely to be present daily.

Full fauna list

The following list shows the most recent year in which each species has been recorded. It is likely to be rather incomplete due to the brevity of observations. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies		Birds			
Yellow-banded Dart	2005	Australian Wood Duck	1999	Brush Wattlebird	2004
		†Pacific Black Duck	2001	Noisy Miner	2004
		†Chestnut Teal	1999	†Magpie-lark	2004
Decapods		Little Pied Cormorant	2001	†Willie Wagtail	2004
Common Yabby	2005	White-faced Heron	1999	Grey Butcherbird	2001
		Masked Lapwing	2001	Australian Magpie	1999
Mammals		*Spotted Turtle-Dove	2004	Welcome Swallow	2001
Water Rat or Rakali	2004	Rainbow Lorikeet	2001	*Common Blackbird	2004
		Eastern Rosella	2004	*Common Starling	2004
		Spotted Pardalote	1999	*Common Myna	2004

Site significance ratings

The following is an assessment of Ryburne Avenue Reserve against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004). The very large old tree at the corner of Ashburn Grove and Winton Rd does not meet any of the BioSites criteria, but is clearly significant in a broader sense.

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to Ryburne Avenue Reserve.

The reserve also approximately fits the description in BioSites criterion 1.2.6 of 'Corridor or component of *'stepping stones'* (includes riparian corridor...) ...important at Local scale', thereby qualifying for **Local** significance.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), degraded native vegetation belonging to an endangered EVC (such as both EVCs present at Ryburne Avenue Reserve) has a conservation significance rating of High.

According to BioSites criterion 3.2.3, State significance applies to any site with a 'remnant patch' whose conservation significance is High or Very High due to the presence of a threatened EVC. This does not apply to Ryburne Avenue Reserve because there is too small an area of native vegetation to qualify as a remnant patch. In this circumstance, the BioSites criteria recognise no significance at all.

Rare or threatened plants

The reserve's populations of the locally threatened species, *Poa labillardierei* and *Goodenia ovata* are apparently ecologically viable, given their persistence to date. A site with any viable population of a locally threatened species is of **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

The recent trapping of the locally endangered Water Rat (or Rakali) on the banks of Gardiners Creek immediately downstream of this site, combined with suitable habitat within the site, qualifies the site for Local significance according to BioSites criterion 3.1.5.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Very serious: Great Brome (<i>Bromus diandrus</i>), Gorse (<i>Ulex europaeus</i>); • Serious: Angled Onion (<i>Allium triquetrum</i>), Sweet Vernal-grass (<i>Anthoxanthum odoratum</i>), Cocksfoot (<i>Dactylis glomerata</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Montpellier Broom (<i>Genista monspessulana</i>), Soursob (<i>Oxalis pes-caprae</i>), Pampas Lily-of-the-Valley (<i>Salpichroa origanifolia</i>); • Moderately serious: Twiggy Turnip (<i>Brassica ?fruticulosa</i>), Large Quaking-grass (<i>Briza maxima</i>), Mirror-bush (<i>Coprosma repens</i>), Cotoneaster (<i>Cotoneaster glaucophyllus</i>), Cotoneaster (<i>Cotoneaster pannosus</i>), Hawthorn (<i>Crataegus monogyna</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Fennel (<i>Foeniculum vulgare</i>), unidentified fumitory (<i>Fumaria</i> sp.), Cleavers (<i>Galium aparine</i>), Perennial Rye-grass (<i>Lolium perenne</i>), Pale Wood-sorrel (<i>Oxalis incarnata</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Ribwort (<i>Plantago lanceolata</i>), Cherry-plum (<i>Prunus cerasifera</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Common Vetch (<i>Vicia sativa</i>). 	All	High	Current
Dumping of garden waste and other rubbish by one or more neighbours.	Locally rare plants; Endangered communities	High	Current
Precariously small numbers of <i>Cotula australis</i> , <i>Dillwynia cinerascens</i> , <i>Pimelea humilis</i> , <i>Rubus parvifolius</i> , <i>Veronica gracilis</i> and <i>Themeda triandra</i> , causing vulnerability to inbreeding or chance events.	The species listed	High	Current

Priority actions

1. Collect seeds or cutting material from all scarce species listed as at risk in the table above, and arrange propagation. Propagated plants can be used to replace their parents if they die, and can be exchanged with nearby sites that have the same species, to allow outbreeding. This task is **urgent and high priority** in the context of the whole municipality.
2. After collecting the propagating material just mentioned, control Blackberry, Gorse and Montpellier Broom (all declared noxious weeds). Cut-and-paint application is appropriate for a high proportion of the plants. Follow up annually for several years. This task is **urgent and high priority** in the context of the whole municipality.
3. A major threat to the native vegetation is from the annual grass weed, Great Brome (*Bromus diandrus*). A trial area of up to 50 m² should be treated with grass-specific herbicide at the lowest on-label rate for annual grasses. This should be done when the largest *Bromus diandrus* plants have five leaves, which is typically in late winter. This technique has worked well using Fusilade[®] herbicide on *Briza maxima* in Dandenong Valley Parklands. The trial could be conveniently done in conjunction with the similar trial recommended for Eric Raven Reserve (Site 22). The location of the trial should be within the scene of Photo 3 below. This task is **urgent and high priority** in the context of the whole municipality.
4. Spot-spray Cocksfoot (*Dactylis glomerata*) tussocks after locating the rare plants indicated above so that they are not inadvertently sprayed. This might be best done following the autumn break, when the tussocks are less obscured by *Senecio hispidulus* and a thatch of *Bromus diandrus*. However, any period of active growth would be satisfactory provided the Cocksfoot is clear enough of desirable plants to allow spraying without significant off-target damage. This task is of moderate urgency and priority in the context of the whole municipality.
5. Discuss the dumping of rubbish and garden waste with neighbours. This is of moderate urgency and importance in the context of the whole municipality.

Past management and revegetation

Ryburne Avenue Reserve's more northeasterly allotment has been subjected to extensive clearing beneath powerlines and more than half of it is kept closely mown. It has also been planted with ornamental species, making it effectively an

extension to the adjacent residential garden. The slope to the southeast of the mown area is used by at least one neighbour for dumping garden waste and other rubbish.

Some weed control has been done in the reserve, but insufficient to have lasting effect, and weeds are now a very serious threat to the reserve's conservation values. Much of the weed problem relates to declared noxious species.

Janyce McMurtrie at the City of Boroondara advises that Melbourne Water organised revegetation in 2001 or 2002, which appears to have been principally near photo points 3 and 4 marked on the aerial photograph on page 232. The plants (or at least, the surviving ones) are thriving. The author also has some suspicions that the Yellow Box trees in that area were planted some years earlier.

Future revegetation

Revegetation in the usual sense of that word is not recommended for the foreseeable future. Weed control is far more urgent and important, and any future revegetation would not survive unless the weeds are brought under control.

Once the weeds are under control, the highest priority should be to improve the viability of the many plant species that have precariously small populations in the reserve (mostly single specimens). As mentioned in Priority Action 1, propagating material of the scarce species should be collected from the reserve for propagation, followed by exchanging plants with nearby bushland sites to increase the population sizes of those species and encourage outbreeding.

Monitoring

The only pre-existing data found during this study that might help monitor the reserve's vegetation is the list of plants compiled by Bruce Muir (of the National Herbarium of Victoria) in 1980. The list helps determine some of the plant species that have been lost since 1980. However, the list is incomplete (e.g. the abundant wallaby-grasses were omitted) and unreliable for some species.

The following items have been gathered to provide additional data for future monitoring:

- The photograph on page 233 of the very large River Red Gum at the corner of Ashburn Grove and Winton Rd, to show the tree's structure and the condition of its crown and bark. Compare the tree with this photograph every two to four years and take a new photograph whenever change is evident;
- The four photographs on page 239, which are for monitoring the prevalence of weeds (and rubbish, in one case) in the understorey. Digital images are available for all these photographs to allow enlargement. Repeat every two to four years. Compare the density of weeds and the structure of the native vegetation;
- The flora lists for the Riparian Woodland and the Escarpment Shrubland, as provided beneath the heading 'Full flora list' above. Repeat every two to four years. Check for changes in the indigenous species present or their abundances, and in the seriousness ratings of the weed species;
- Population counts of scarce plant species, as given in the sections headed 'Habitat types' and 'Flora of special significance'. Three populations are mapped on the aerial photograph on page 232. Repeat every two to four years;
- Ratings of weed severity, as listed under the heading 'Threats' above. Repeat every two to four years.

Information sources used in this assessment

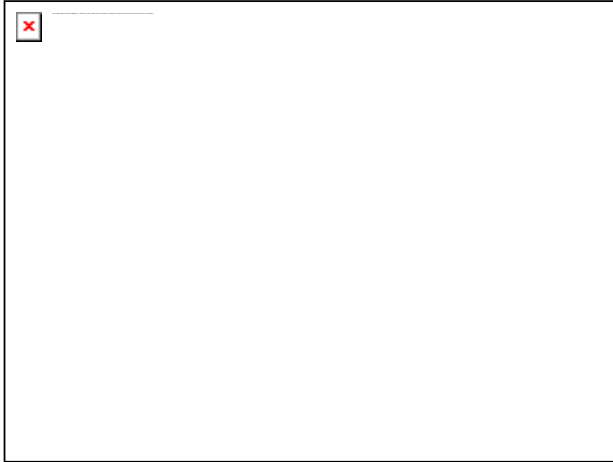
- Measurement, health assessment and two photographs of the very large old River Red Gum at the corner of Ashburn Grove and Winton Rd, on 21/2/05;
- A vegetation and habitat survey of Ryburne Avenue Reserve by Dr Lorimer for a total of one hour and fifty minutes on 18/10/04 and 21/2/05, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous plant species within each of the two EVCs in the reserve, including their abundances, as well as a list of weed species and the threat level of each;
 - Mapping, counting and recording populations of plant species that are rare or threatened in the site or more generally;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- The report by Quin D.G., Cook S. and McMahan J. (2004): '*Gardiners Creek Water Rat* *Hydromys chrysogaster* Survey'. Report from Ecology Australia to Melbourne Water. iv + 30 pp + data spreadsheet;
- Information from the Department of Sustainability & Environment's flora and fauna databases (including a 1980 plant list by Bruce Muir of the National Herbarium of Victoria);
- The Department of Sustainability & Environment's BioMaps of the area;
- Aerial photography from August 2004;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

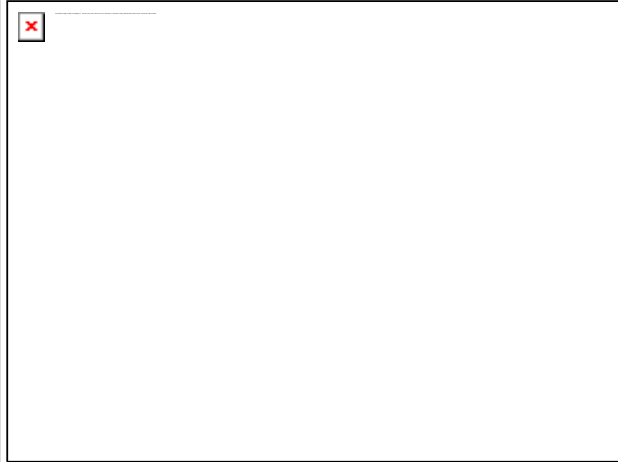
It is recommended that Council investigate whether neighbours could be persuaded to be more sensitive to the reserve's very high (but inconspicuous) conservation values, particularly regarding dumping of waste.

Monitoring photographs for Ryburne Avenue Reserve, taken on 21st February, 2005

The locations and orientations of the photographs are shown on the aerial photograph on page 232.



Site 24, Photo 2. Looking east, with the western edge of the reserve in the middle distance. Note the canopies of paperbarks and Yellow Box within the reserve, and the prevalence of weeds between there and the camera.



Site 24, Photo 3. Looking southeast from an informal path, to show the vegetation structure and the high density of *Senecio hispidulus* and ground flora weeds such as Cocksfoot (*Dactylis glomerata*).



Site 24, Photo 4. A southwesterly view from the same location as Photo 3, highlighting the very high density of Gorse and Cocksfoot. One of the richest patches of indigenous ground flora is immediately downhill, being invaded by these weeds.



Site 24, Photo 5. Looking from the edge of the mown area of reserve near the neighbouring house, with *Dillwynia cinerascens* right in the centre, surrounded by weeds and dumped garden waste, rubble and earth. The weed, *Salpichroa organifolia*, is climbing over *Bursaria spinosa* bushes next to the *Dillwynia*.

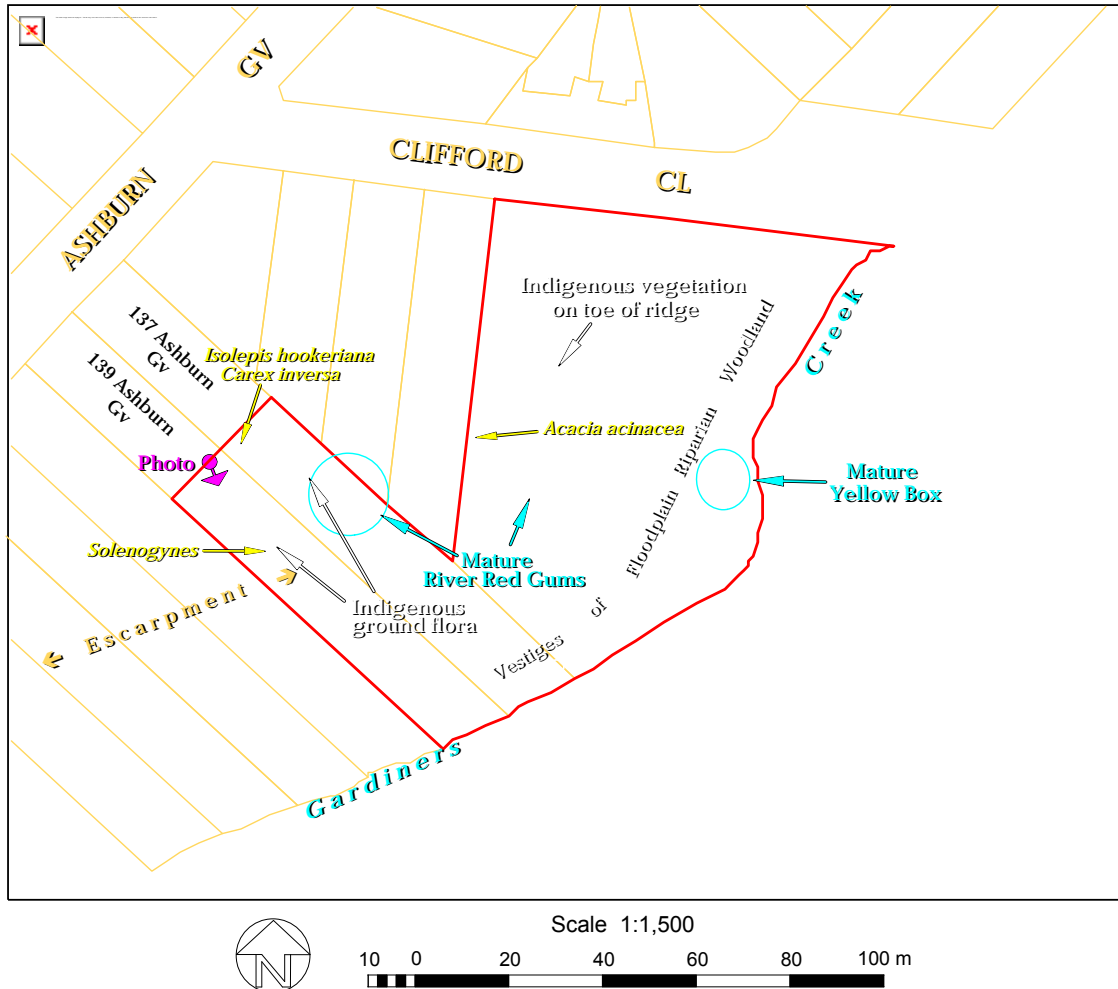
Site 25. Clifford Close Reserve, Ashburton

Vestiges of native riparian vegetation, plus remnant ground flora in two former backyard lawns. Melway ref. 60 C12.

Site Biological Significance Level: *Local*

Summary of significant natural assets:

- Tiny areas of two endangered Ecological Vegetation Classes: Floodplain Riparian Woodland and Plains Grassy Woodland;
- Viable populations of up to eight plant species that are threatened in Boroondara;
- The site is part of the Gardiners Creek ecological corridor.



Boundaries

This site occupies the whole of Clifford Close Reserve, which is outlined in red above. However, much of the reserve is of no biological significance, being covered with mown lawn of introduced grass. The main areas of significance are outlined in white or blue above. Eucalypts outside these areas provide some additional habitat for native birds and insects.

Land use & tenure

City of Boroondara reserve, including what once formed part of the backyards of 137 & 139 Ashburn Grove. Melbourne Water has some responsibility for management of the waterway.

Physical features

Site area: 0.8 hectares.

Elevation: Gardiners Creek's normal water level is at an elevation of approximately 25 m. The elevation abutting 137 & 139 Ashburn Grove is 36 m.

Landform: Floodplain, stream escarpment and undulating plateau above the escarpment.

Slope: Very steep on the escarpment, and gently sloping (typically 1:10 gradient) elsewhere.

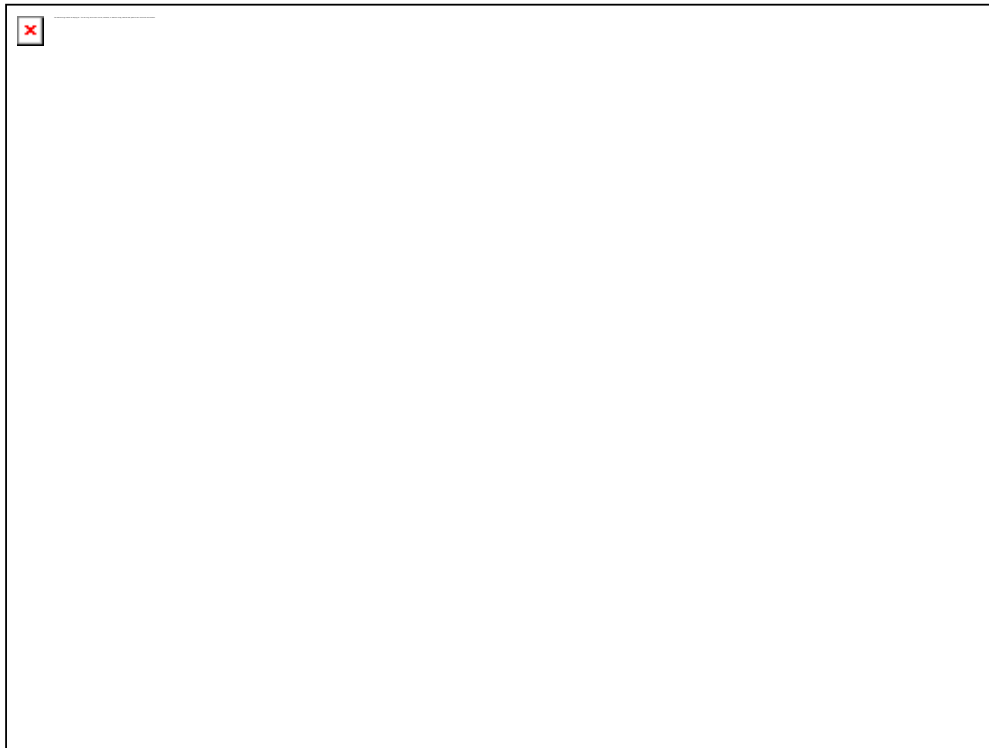
Soil type: The floodplain has alluvial soil and the elevated ground has pale loam or sandy loam with clay subsoil.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek Formation, exposed in places as pale orange to whitish siltstone or sandstone.

Site description

Clifford Close Reserve is at the intersection of Gardiners Creek and an ancient course of Gardiners Creek that used to flow to the northwest, across Clifford Close. As marked on the aerial photograph, there is a very steep escarpment parallel to the present-day Gardiners Creek, terminating slightly east of the mature River Red Gum (*Eucalyptus camaldulensis*) marked on the aerial photograph.

Perhaps the most biologically interesting part of the reserve is just above the escarpment, in what was once part of the backyards of 137 & 139 Ashburn Grove. The only remnant tree cover remaining is the abovementioned River Red Gum and the overhanging branches of a Yellow Box (*Eucalyptus melliodora*) that grows in 141 Ashburn Grove, and there are no remnant shrubs, as seen in the photo below. The ground flora is mown each spring (typically September), allowing native grasses and some wildflowers to persist.



Site 25 Photo. The former back lawn of 139 Ashburn Grove, dominated by Weeping Grass (foreground) and Kangaroo Grass (beyond about seven metres from the camera). The blue flagging tape that is just visible near the right edge of the photograph is on a Chocolate Lily. Pale Sundew grows along the strip of Weeping Grass. The camera is at the access point from 139 Ashburn Grove. This photograph can be used to monitor the density of native grasses and weeds.

The former backyard of 137 Ashburn Grove is similar to what is shown in the photograph above, but suffers more ecological damage due to greater usage as a backyard (e.g. for playing or putting garden waste). Among the tiny indigenous plants in the grass to the rear of 137 & 139 Ashburn Grove are six species threatened with extinction in Boroondara. The total area that has a substantial cover of indigenous ground flora is approximately 500 m². The vegetation was once Plains Grassy Woodland, which is an endangered Ecological Vegetation Class (or EVC).

The escarpment itself has very little native vegetation within the reserve (apparently limited to one Black Wattle, *Acacia mearnsii*), but it does have a reasonable cover of remnant Yellow Box and wattles on private properties to the southwest. These private properties are outside the scope of the present study, but their biological significance should not be overlooked. The Yellow Box trees and wattles belong to the endangered EVC, Escarpment Shrubland.

Below the escarpment, 90% of the floodplain in Clifford Close Reserve is mown regularly and supports hardly any indigenous plants. The remaining 10% includes indigenous vegetation within the areas outlined in white on the aerial photograph on page 240.

The area labelled as being on the toe of a ridge is precisely at the divergence between the ancient and current courses of Gardiners Creek. The remnants of Plains Grassy Woodland at that location include River Red Gums, patches of native grass and two shrubs. There are also planted River Red Gums and Black Wattles. One of the shrubs is a Gold-dust Wattle (*Acacia acinacea*), the only naturally occurring specimen found during this whole study. It is an unusually large specimen, suggesting that it has not been planted (consistent with the lack of any evidence that this species has been planted in the reserve).

The remnant indigenous flora in the small patches of indigenous vegetation beside Gardiners Creek include Swamp Paperbark (*Melaleuca ericifolia*), wattles, native grass, Yellow Box and Swamp Gum (*Eucalyptus ovata*). These are all interspersed among abundant weeds. The indigenous plants belong to the endangered EVC, Floodplain Riparian Woodland.

Ecological links with other land

Clifford Close Reserve has so little native vegetation that hardly any species of native flora or fauna could persist in isolation from other habitat.

The patches of riparian vegetation outlined in white on the aerial photograph are complemented by denser indigenous trees on the opposite bank (in the City of Stonnington). There are substantial gaps in the native vegetation beside Gardiners Creek, but not enough to prevent many birds (and no doubt insects) from moving along the corridor daily. The White-faced Heron, Little Pied Cormorant, Spotted Pardalote and several duck species were among the birds that the author saw repeatedly moving along the creek within or near Clifford Close Reserve (e.g. at Markham Reserve (Site 26), Malvern Valley Public Golf Course (in Stonnington) and Ryburne Avenue Reserve (Site 24)).

Seeds and pollen of some indigenous plants can also move along the corridor, aided by the fauna or sometimes by floodwater.

Clifford Close Reserve is also only 100 m from the Outer Circle Railway corridor (Site 31), and some birds and insects are likely to move between the reserve and the rail corridor.

Adjacent remnant trees on the escarpment to the southwest of the reserve contribute toward the continuity of native vegetation along Gardiners Creek and its connection with the Outer Circle Railway corridor.

The nearby sites that probably provide the most important contributions toward the habitat needs of fauna in the area are Markham Reserve (Site 26), Malvern Valley Public Golf Course (in Stonnington), the Outer Circle Railway corridor (Site 31), Ryburne Avenue Reserve (Site 24) and Dorothy Laver Reserve (Site 23), linked together by Gardiners Creek (Site 19).

Populations of most indigenous plant species in the former back lawns of 137 & 139 Ashburn Grove appear to be reproductively disconnected from other populations, but most of their populations are probably stable anyway.

Habitat types

Floodplain Riparian Woodland (EVC 56, *endangered* in the Gippsland Plain bioregion).

This EVC is represented in the reserve by patches totally approximately 300 m² beside Gardiners Creek, subject to periodic inundation. Thirteen indigenous plant species were found.

Canopy trees: Dominated by *Eucalyptus melliodora* and *Eucalyptus ovata*, with a single *Eucalyptus camaldulensis* sapling at the reserve's southern corner.

Lower trees: The indigenous species are *Acacia implexa*, *Acacia mearnsii* and patches of *Melaleuca ericifolia*. The weed *Fraxinus angustifolia* is plentiful.

Shrubs, vines and ferns: No indigenous species.

Ground flora: *Danthonia racemosa* and *Danthonia ?setacea* are present in moderate numbers. *Crassula decumbens* occurs opportunistically in bare patches next to the mature *Eucalyptus melliodora*. There is a strip of *Phragmites australis* in the southwestern patch. The low weeds *Allium triquetrum* and *Vinca major* are abundant and represent a serious environmental threat.

Plains Grassy Woodland (EVC 55, *endangered* in the Gippsland Plain bioregion).

The remnants of this EVC cover approximately 800 m². Sixteen indigenous plant species were found behind 137-139 Ashburn Grove and eight species were found at the toe of the ridge.

Canopy trees: *Eucalyptus camaldulensis*, with *Eucalyptus melliodora* present on adjacent land.

Lower trees: *Acacia mearnsii*, both natural and planted.

Shrubs: Single specimens of *Acacia acinacea* and *Bursaria spinosa*, both at the toe of the ridge. Planted ornamental shrubs have replaced native shrubs behind 137-139 Ashburn Grove.

Vines and ferns: None.

Ground flora: Behind 137-139 Ashburn Grove, the ground flora is dominated variously by the native grasses, *Microlaena stipoides* and *Themeda triandra*. *Luzula meridionalis* var. *densiflora* is abundant but not dominant. At the toe of the ridge, the indigenous ground flora comprises only scattered wallaby-grasses and *Crassula decumbens*.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Notes
Endangered	<i>Luzula meridionalis</i>	Numerous behind 139 Ashburn Grove.
Endangered	<i>Acacia acinacea</i>	1 large shrub next to the wall of the garage at 8 Clifford Close.
Endangered	<i>Drosera peltata</i> subsp. <i>peltata</i>	6 plants on the left edge of the photograph on page 241.
Endangered	<i>Eucalyptus ovata</i>	1 found beside Gardiners Creek.
Endangered	<i>Solenogyne gunnii</i>	20 plants within 0.1 m ² , marked on the aerial photograph.
Vulnerable	<i>Isolepis hookeriana</i>	A few dozen behind 137 Ashburn Gr – see aerial photo.
Vulnerable	<i>Phragmites australis</i>	Dense within c. 40 m ² beside Gardiners Creek.
Vulnerable	<i>Schoenus apogon</i>	Scattered behind 137 & 139 Ashburn Grove.
Vulnerable	<i>Eucalyptus melliodora</i>	Scattered along Gardiners Ck and on neighbouring properties.
Vulnerable	<i>Solenogyne dominii</i>	20 plants within 1 m ² , marked on the aerial photograph.
Data Deficient	<i>Carex inversa</i>	Possibly not an indigenous form. Marked on the aerial photo.

Full flora list

The following table lists the species of plants recorded at Clifford Close Reserve by the author on 6/10/04. The column headed 'PGW' is for the areas of Plains Grassy Woodland, and the column headed 'FRW' is for the vestiges of Floodplain Riparian Woodland beside Gardiners Creek. In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Species with underlined names represent good resources for collection of seed or cuttings (as long as care is taken not to unreasonably deplete the site).

Species Name	PGW	FRW	Species Name	PGW	FRW	Species Name	PGW	FRW
Indigenous			<i>Melaleuca ericifolia</i>		D	<i>Dactylis glomerata</i>		✓
<i>Acacia acinacea</i>	-		<i>Microlaena stipoides</i>	D		<i>Ehrharta erecta</i>	✓	
<i>Acacia implexa</i>		✓	<i>Muellerina eucalyptoides</i>		✓	<i>Fraxinus angustifolia</i>		✓
<i>Acacia mearnsii</i>	-	✓	<i>Oxalis exilis/perennans</i>	✓		<i>Galium aparine</i>		✓
<i>Arthropodium strictum</i>	-		<i>Schoenus apogon</i>	✓		<i>Hedera helix</i>		✓
<i>Austrodanthonia fulva</i>	✓	✓	<i>Senecio quadridentatus</i>	-		<i>Hypochoeris radicata</i>	✓	
<i>Austrodanthonia racemosa</i>	✓	✓	<i>Solenogyne dominii</i>	✓		<i>Juncus capitatus</i>	✓	
<i>Austrodanthonia setacea</i>	✓	✓	<i>Solenogyne gunnii</i>	✓		<i>Plantago lanceolata</i>	✓	
<i>Austrostipa rudis rudis</i>	-		<i>Themeda triandra</i>	D		<i>Romulea rosea</i>		M
<i>Bursaria spinosa</i>	-	-	Introduced species			<i>Sonchus oleraceus</i>	✓	
<i>Carex inversa</i>	✓		<i>Allium triquetrum</i>	-	✓	<i>Sporobolus africanus</i>	✓	
<i>Crassula decumbens</i>	✓	✓	<i>Anthoxanthum odoratum</i>		✓	<i>Trifolium repens</i>	✓	
<i>Drosera peltata</i> ssp. <i>peltata</i>	✓		<i>Bellis perennis</i>	✓		<i>Ulex europaeus</i>		✓
<i>Eucalyptus camaldulensis</i>	D	-	<i>Centaureum erythraea</i>	✓		<i>Veronica persica</i>	✓	
<i>Eucalyptus melliodora</i>		✓	<i>Cerastium glomeratum</i>	✓		<i>Vinca major</i>		✓
<i>Isolepis hookeriana</i>	✓		<i>Coprosma repens</i>		✓	<i>Vulpia bromoides</i>	✓	
<i>Luzula meridionalis</i>	M		<i>Cyperus tenellus</i>	✓		? <i>Watsonia</i> sp.	✓	

Fauna of special significance

The only significant fauna species detected by the author during the brief inspection of Clifford Close Reserve was a Spotted Pardalote (locally endangered), foraging in trees on both sides of Gardiners Creek. However, the inspection was

too brief to detect most of the fauna that use the reserve, and no prior observations could be found in the Department of Sustainability & Environment's database.

Site significance ratings

The following is an assessment of Clifford Close Reserve against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to Clifford Close Reserve.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), the areas of Clifford Close Reserve that have native understorey qualify for a conservation significance rating of High because they constitute degraded representations of two endangered EVCs.

According to BioSites criterion 3.2.3, State significance applies to any site with a 'remnant patch' whose conservation significance is High or Very High due to the presence of an endangered EVC. This does not apply to Clifford Close Reserve because there is too small an area of native vegetation to qualify as a remnant patch. In this circumstance, the BioSites criteria recognise no significance at all.

Rare or threatened plants

The reserve's populations of most of the locally threatened species listed in the section headed 'Flora of special significance' above are apparently ecologically viable. A site with any viable population of a locally threatened species is of **Local** significance according to BioSites criterion 3.1.5.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds by the creek. The species of concern are: <ul style="list-style-type: none"> • Serious: Angled Onion (<i>Allium triquetrum</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Blue Periwinkle (<i>Vinca major</i>); • Moderately serious: Sweet Vernal-grass (<i>Anthoxanthum odoratum</i>), Mirror-bush (<i>Coprosma repens</i>), Cocksfoot (<i>Dactylis glomerata</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Cleavers (<i>Galium aparine</i>), Ivy (<i>Hedera helix</i>), Gorse (<i>Ulex europaeus</i>). 	Floodplain Riparian Woodland and dependent fauna	Moderate	Current
Environmental weeds near 137 & 139 Ashburn Grove. The species of concern are: <ul style="list-style-type: none"> • Serious: Common Onion-grass (<i>Romulea rosea</i>); • Moderately serious: Common Mouse-ear Chickweed (<i>Cerastium glomeratum</i> s.l.), Tiny Flat-sedge (<i>Cyperus tenellus</i>), Cat's Ear (<i>Hypochoeris radicata</i>), Dwarf Rush (<i>Juncus capitatus</i>), Ribwort (<i>Plantago lanceolata</i>), Indian Rat-tail Grass (<i>Sporobolus africanus</i>), Squirrel-tail Fescue (<i>Vulpia bromoides</i>), an irid (suspected to be <i>Watsonia meriana</i> var. <i>bulbillifera</i>). 	Plains Grassy Woodland; locally threatened plant species	Moderate	Current
Recreational uses of the area to the rear of 137 Ashburn Grove.	As above	Moderate	Current
Precariously small populations of some plant species, causing vulnerability to inbreeding or chance events.	Significant flora	Moderate	Current

Priority actions

1. Convey the information in this site assessment to the residents of 137, 139 & 141 Ashburn Grove and 4 Clifford Close to assist their understanding of the importance of the adjoining native vegetation and the potential impacts of their use of the land.

2. Discuss with people at 137 & 139 Ashburn Grove the desirability of leaving the native ground flora unmown between May and the end of October each year (or preferably until November).
3. Make whatever additional inquiries are possible about whether the *Acacia acinacea* shrub may have been planted. If it still seems not to have been planted, seek to establish a breeding population around it by:
 - a) Checking whether the plant produces any seed in late 2006, which should then be propagated; and
 - b) Planting any progeny that may result from step (a), along with several other *Acacia acinacea* raised from seed collected either in Yarra Bend Park or another nearby natural population.
4. Remove Desert Ash trees from beside the creek and re-plant with Yellow Box and *Eucalyptus viminalis* subsp. *pryoriana*, raised from local seed.
5. Consider plantings recommended below.

Past management and revegetation

The native ground flora to the rear of 137 & 139 Ashburn Grove have been treated as back lawns by occupants of those properties for many years. The mowing behind 137 Ashburn Grove has evidently been more frequent than behind 139 Ashburn Grove and the use for domestic purposes has been greater, causing the ground flora to be less rich and dense in indigenous species.

The floodplain has been mown regularly for many years, except for the narrow strip of riparian vegetation. Some Australian native trees have been planted in the lawn.

Future revegetation

It would be desirable to plant two Yellow Box trees (*Eucalyptus melliodora*) and a small number of Black Wattles (*Acacia mearnsii*), Lightwood (*Acacia implexa*) and Sweet Bursaria (*Bursaria spinosa*) on the escarpment to the southeast of 137 and 139 Ashburn Grove. This would complement the native vegetation on private properties to the southwest and link them to the mature River Red Gum to the rear of 139 Ashburn Grove.

It would also be desirable to improve the continuity of riparian vegetation along Gardiners Creek by planting indigenous species of Floodplain Riparian Woodland to the southwest of the existing riparian vegetation. This is particularly important in the section where there are no shrubs or trees on either side of the creek, near the reserve's southern tip.

Monitoring

This study found no pre-existing data suitable for ecological monitoring.

The following items have been gathered to provide data for future monitoring:

- The photograph of the grassy area to the rear of 139 Ashburn Grove (page 241). Repeat every two to four years in September or October, before the grass receives its first cut for the spring. Arrangements may need to be made with the adjoining residents to avoid cutting before the photograph can be taken;
- The flora lists for the Floodplain Riparian Woodland and the Plains Grassy Woodland, as provided in the section headed 'Full flora list' above. Repeat every two to four years. Check for changes in the species present or their abundances;
- Population counts of scarce plant species. In addition to the counts given in the section headed 'Flora of special significance', note that in 2004 the author detected a single *Arthropodium strictum* (visible in the photograph on page 241) and three plants of *Austrostipa rudis* to the rear of 139 Ashburn Grove. The locations of *Carex inversa*, *Isolepis hookeriana*, *Eucalyptus melliodora* and both species of *Solenogyne* are mapped on the aerial photograph on page 240. Repeat every two to four years;
- Ratings of weed severity, as listed under the heading 'Threats' above. Repeat every two to four years.

Information sources used in this assessment

- Vegetation and habitat surveys by Dr Lorimer for a total of approximately 2½ hours on 6th October 2004 and 1st December 2005, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of weeds and indigenous plant species within each of the two EVCs in the reserve, including their abundances and the threat level of each weed species;
 - Mapping, counting and recording populations of plant species that are rare or threatened in the site or more generally;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Discussion with occupants of 139 & 141 Ashburn Grove about the past management of the area of indigenous ground flora;

- Information from the Department of Sustainability & Environment's flora and fauna databases (which appear to contain no data relevant to this reserve);
- The Department of Sustainability & Environment's BioMaps of the area;
- Aerial photography from August 2004;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

No further investigation is recommended other than the monitoring mentioned above and the recommended discussion with occupants of 137 & 139 Ashburn Grove.

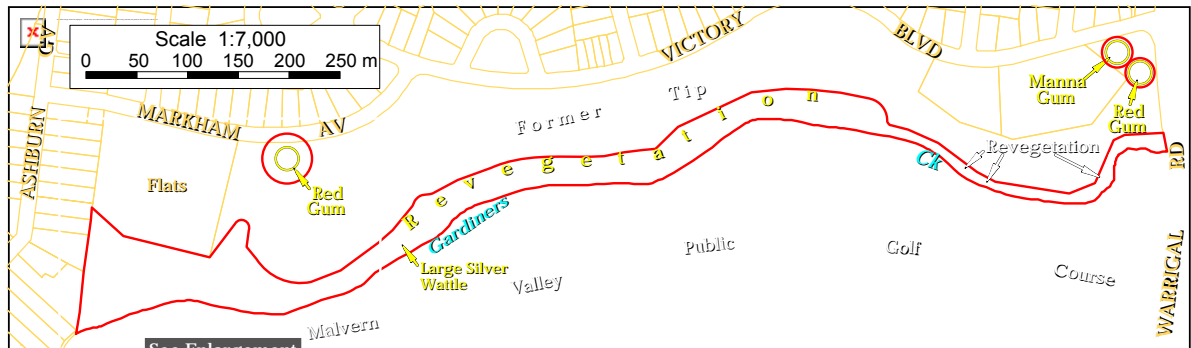
Site 26. Markham Reserve, Ashburton

A section of Gardiners Creek, its riverbank and adjacent Red Gum woodland, plus revegetation. Melway ref. 60 E12.

Site Biological Significance Level: *State*

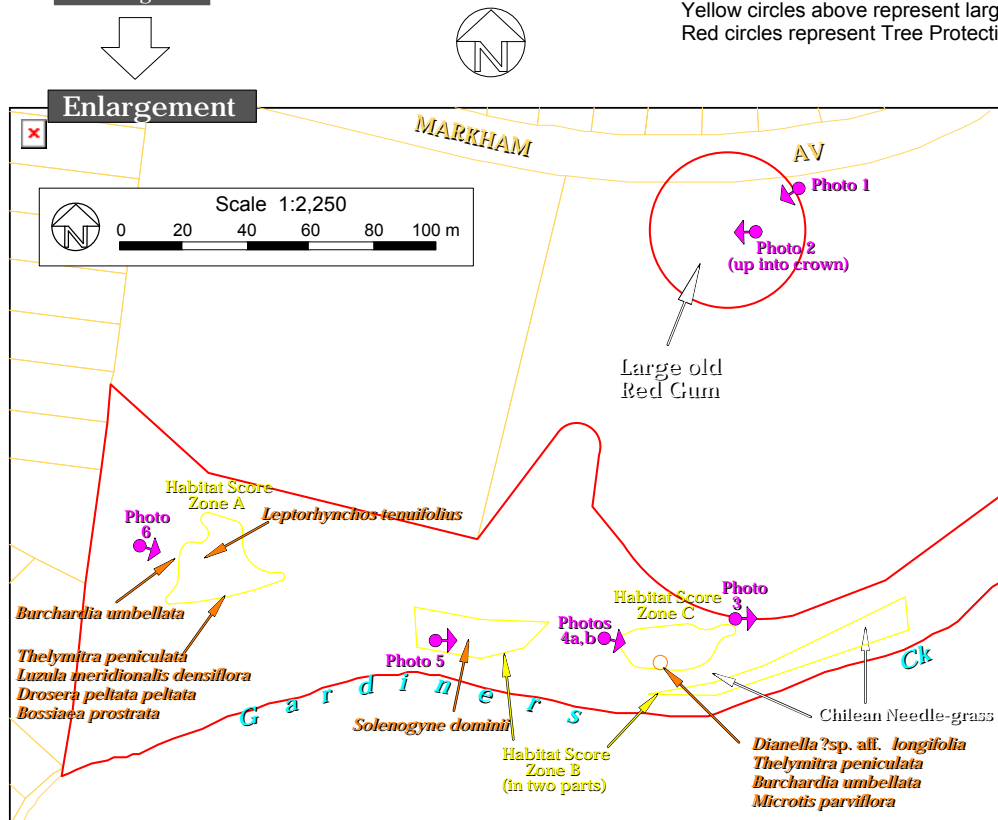
Summary of the most significant natural assets:

- Small patches of two endangered Ecological Vegetation Classes: Plains Grassy Woodland and Riparian Woodland;
- Apparently viable populations of at least twelve plant species that are threatened in Boroondara, some of them abundant;
- The site is part of the Gardiners Creek ecological corridor.



See Enlargement

Yellow circles above represent large old trees.
Red circles represent Tree Protection Zones.



Boundaries

This site of biological significance is outlined in red on the aerial photographs above. Three of the site's four parts are circles representing Tree Protection Zones around large old trees. The radius of each circle is eighteen times the diameter of the associated tree trunk, following the recommendation of Matheny and Clark (1998) for over-mature trees that are sensitive to root disturbance. The largest, non-circular part of the site is bordered by:

- Gardiners Creek to the south and Warrigal Rd to the east, both of which are parts of the municipal boundary;

- Private property to the west;
- A fence to the south of the labelled flats; and
- The northern limit of native vegetation, revegetation or the creek channel.

Land use & tenure

City of Boroondara reserve, for conservation, amenity, recreation and drainage.

Physical features

Site area: 3.9 hectares in total.

Elevation: Gardiners Creek's normal water level is at an elevation of approximately 27 m. The highest elevation is 43 m beneath the Manna Gum marked on the broad-scale aerial photograph.

Landform: Riverbank, valley floor and adjacent lower slope, modified by excavations (particularly for a former tip).

Slope: Very steep on the embankment of the creek channel; moderately steep (typically 1:3) on the revegetated embankment between the creek and the former tip, and gently sloping (typically 1:10 gradient) elsewhere.

Soil type: The natural soil is recent, low-level alluvium close to the creek, and older, high-level alluvium (from an ancient floodplain) elsewhere. However, excavations have replaced or altered the natural soil, particularly in the central parts of the site. The natural soil appears to be a brown, sandy loam.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek Formation, exposed in the creek bed as pale orange to whitish siltstone or sandstone. However, most of the native vegetation grows where the bedrock is buried under approximately five metres of alluvium, so the nature of the bedrock is unimportant.

Site description

The site includes:

- Three large old trees surrounded by mown lawn;
- The section of Gardiners Creek that borders Markham Reserve;
- The creek bank, including revegetation and remnant indigenous flora scattered thinly along the bank; and
- Patches of less modified remnant vegetation, complete with ground flora, depicted on the enlarged aerial photograph.

The most biologically significant features of Markham Reserve are in the last of these areas, where the remnant vegetation belongs to two endangered Ecological Vegetation Classes (EVCs). Among the ground flora there are numerous plant species that are threatened in Boroondara. In the past decade, the City of Boroondara has been increasingly trying to restore the remnant vegetation in this area by reduced mowing, hand weeding, spot spraying, infill planting and ecological burning.

The riverbank to the east of the aerial photograph enlargement, at the edge of a former rubbish tip, has become perhaps the largest revegetation project in Boroondara. Because the revegetation is only about two years old, it has not yet grown to provide much habitat. Nevertheless, it is important for the role it will play in the riparian environment and assisting movement of native birds along Gardiners Creek. The waterway shows good signs of acting as a wildlife corridor, as discussed below.

In addition to the reserve's importance for nature conservation, the reserve is popular with cats and people walking dogs. Humans and pets walking through habitat areas represent a degree of conflict with conservation values. The richest wildlife appears to be concentrated in areas with less traffic of people and pets, even where the habitat appears inferior.

Ecological links with other land

Markham Reserve has just enough native vegetation for most species of native flora to be able to persist with little or no recruitment of seeds or pollen from outside the site. Lizards and non-flying invertebrates are probably also able to maintain viable populations independently of the site's surroundings. However, birds, fish and most flying insects in the reserve could not survive in isolation.

The golf course on the opposite side of Gardiners Creek (in the City of Stonnington) has water bodies that attract waterbirds to the area, some of which were seen on Gardiners Creek. Many birds (and no doubt insects) move along the creek corridor daily. The White-faced Heron, Little Pied Cormorant, Spotted Pardalote and several duck species were among the birds that the author saw repeatedly moving along the creek at Markham Reserve.

Seeds and pollen of some indigenous plants can also move along the corridor, aided by fauna or sometimes by floodwater.

There may be ecological connections to parts of Gardiners Creek further upstream (outside Boroondara), but this was not investigated because it is outside the geographical scope of this study.

Planted Australian native trees in the neighbourhood, particularly around the adjacent housing commission flats, attract parrots (particularly Musk Lorikeets) to the area and augment the habitat available in Markham Reserve.

Habitat types

Perennial Stream (No EVC number).

Gardiners Creek provides habitat for fish and other aquatic fauna. Submerged plants were sought but not detected. The streambed and channel have been extensively modified by earthworks and bank stabilisation.

Plains Grassy Woodland (EVC 55, **endangered** in the Gippsland Plain bioregion).

Plains Grassy Woodland is represented by the native vegetation growing beyond 10-15 m from the brow of the creek channel embankment (varying according to the height of the embankment).

Canopy trees: Dominated by *Eucalyptus camaldulensis*, with some *Eucalyptus melliodora*.

Lower trees: *Acacia mearnsii* is abundant.

Shrubs: Scattered *Bursaria spinosa*.

Vines and ferns: None.

Ground flora: The indigenous flora are dominated mostly by *Themeda triandra*, but there are patches dominated by *Microlaena stipoides*. The following indigenous species are abundant but not dominant: *Drosera peltata* subsp. *peltata*, *Gonocarpus tetragynus*, *Lomandra filiformis* subsp. *coriacea*, *Oxalis exilis/perennans*, *Schoenus apogon* and *Tricoryne elatior*. Some areas are dominated by the grass weed, *Anthoxanthum odoratum*, or the moss weed, *Pseudoscleropodium purum*.

Riparian Woodland (EVC 641, **endangered** in the Gippsland Plain bioregion).

This EVC forms a strip extending from the water's edge of Gardiners Creek for a width of 10-15 m where it abuts the Plains Grassy Woodland (see above). It could be considered ecotonal between the Plains Grassy Woodland and the Floodplain Riparian Woodland that once occurred on the swampier, southern side of Gardiners Ck. Oates and Taranto (2001) evidently anticipated the inclusion of such vegetation within Riparian Woodland when they wrote, 'The vegetation on drier banks and levees within Floodplain Riparian Woodland is presumably a form of Riparian Woodland'.

Canopy trees: In decreasing order of abundance, the dominant eucalypts are *Eucalyptus ovata*, *Eucalyptus camaldulensis*, *Eucalyptus melliodora* and *Eucalyptus viminalis*.

Lower trees: *Melaleuca ericifolia* is fairly abundant from the creek to the top of the creek embankment. *Acacia melanoxylon*, *Acacia mearnsii* and *Acacia implexa* extend further from the creek.

Shrubs: *Bursaria spinosa* is abundant.

Vines and ferns: None.

Ground flora: *Phragmites australis* grows in small numbers on the embankment. Indigenous species that grow in the zone where their roots are normally saturated include large numbers of *Isolepis cernua* and *Lunularia cruciata*, as well as moderate numbers of *Juncus gregiflorus* and *Persicaria decipiens*. *Lomandra longifolia* is abundant near the brow of the creek embankment. Above that level, there is a rich assemblage of indigenous grasses, among which are five *Austroanthonia* species, but the dominant grasses of the Plains Grassy Woodland area (*Themeda triandra* and *Microlaena stipoides*) are scarce in the Riparian Woodland. The small herbs, *Bossiaea prostrata*, *Cotula australis*, *Crassula decumbens* and *Solenogyne dominii* are present in small numbers.

Flora of special significance

The significant plant species below have been recorded in Markham Reserve. Those with a 'Last Record' date of 2004 or 2005 were observed by the author. The three species whose names are prefixed with an obelisk (†) were recorded by Ecology Australia Pty Ltd (1995) and are regarded by the present author as dubious. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status			Species Name	Last Record	Notes
Victoria	Melbourne	Boroondara			
Vulnerable	Rare or threatened	Endangered	<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	1994	Scarce in 1994; 1 young <i>Dianella</i> in 2005 may be the same species.
	Rare or threatened	Endangered	† <i>Austrostipa rudis</i> subsp. <i>nervosa</i>	1995	Recorded by Ecology Aust (1995) as abundant.
	Rare or threatened	Dubiously natural	† <i>Austroanthonia duttoniana</i>	1995	Recorded by Ecology Aust (1995) as fairly abundant.
		Dubiously natural	† <i>Bolboschoenus caldwellii</i>	1994	Recorded by Ecology Aust (1995) as scarce.
		Critically Endangered	<i>Burchardia umbellata</i>	2005	Two clusters of three plants each.

Conservation Status			Species Name	Last Record	Notes
Victoria	Melbourne	Boroondara			
		Critically Endangered	<i>Hypoxis hygrometrica</i>	1993-4	Near the cricket nets.
		Critically Endangered	<i>Luzula meridionalis</i> var. <i>meridionalis</i>	1995	Recorded by Ecology Aust (1995) as scarce.
		Critically Endangered	? <i>Triglochin striata</i>	2005	1 patch in Gardiners Creek
		Critically Endangered	<i>Wurmbea dioica</i>	1993-4	Near the cricket nets.
		Critically Endangered	<i>Eucalyptus viminalis</i> subsp. <i>pryoriana</i>	2005	One by the creek south of the flats.
		Critically Endangered	<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	2005	One near Warrigal Rd, perhaps planted.
		Critically Endangered	<i>Haloragis heterophylla</i>	2005	1 patch, 9.4 m × ~3½ m, in habitat score zone C. See photos, p. 261.
		Critically Endangered	<i>Leptorhynchus tenuifolius</i>	2005	Four individuals were seen.
		Critically Endangered	<i>Opercularia ovata</i>	2005	Moderate numbers.
		Endangered	<i>Lepidosperma laterale</i> var. <i>laterale</i>	1994	From Ecology Aust (1995), but not in the data they provided to Dept of Sustainability & Environment.
		Endangered	<i>Lomandra longifolia</i>	2005	Fairly common. Some planted?
		Endangered	<i>Luzula meridionalis</i> var. <i>densiflora</i>	2005	Only 2 found, south of the flats.
		Endangered	<i>Thelymitra peniculata</i>	2005	One group of 3 in habitat score zone C and 2 south of the flats.
		Endangered	<i>Bossiaea prostrata</i>	2005	>15 counted, scattered.
		Endangered	<i>Drosera peltata</i> ssp. <i>peltata</i>	2005	Numerous, scattered.
		Endangered	<i>Eucalyptus ovata</i>	2005	A structural dominant.
		Vulnerable	<i>Austrodanthonia eriantha</i>	1994	Scarce, according to Ecology Aust.
		Vulnerable	<i>Austrodanthonia laevis</i>	2005	Fairly numerous, near the oval.
		Vulnerable	<i>Austrodanthonia penicillata</i>	2005	Moderate numbers.
		Vulnerable	<i>Carex breviculmis</i>	1995	Substantial numbers in 1995, according to Ecology Australia.
		Vulnerable	<i>Juncus subsecundus</i>	2005	1 individual found, south of flats.
		Vulnerable	<i>Microtis parviflora</i>	2005	1 individual in habitat score zone C.
		Vulnerable	<i>Phragmites australis</i>	2005	In patches along the creek.
		Vulnerable	<i>Poa morrisii</i>	2005	Fairly numerous, scattered.
		Vulnerable	<i>Schoenus apogon</i>	2005	Numerous, scattered.
		Vulnerable	<i>Eucalyptus melliodora</i>	2005	Moderate numbers.
		Vulnerable	<i>Gonocarpus tetragynus</i>	2005	Numerous, scattered.
		Vulnerable	<i>Solenogyne dominii</i>	2005	1 individual, southeast of the flats.
		Data Deficient	<i>Austrodanthonia bipartita</i>	1994	Possibly misidentified.

Full flora list

The following table is a composite of eight plant lists compiled by the author in 2004-5, seven lists compiled by G.W. Carr and A. Muir of Ecology Australia in 1994-5, and observations by Tony Cowdell in 1993-4 (denoted by the subscript AWC on the species names). Only wild plants are included. Some of the species that appear in the 1995 Ecology Australia report do not appear in the corresponding lists held by the Department of Sustainability & Environment, for reasons that could not be determined (but which probably relate to quality control). Such records are omitted here. The names of species from the Ecology Australia report that are regarded here as dubious are prefixed with an obelisk (†).

The column headed 'PGW' is for the Plains Grassy Woodland and the column headed 'RW' is for the Riparian Woodland. In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Species with underlined names represent good resources for collection of seed or cuttings (as long as care is taken not to unreasonably deplete the site).

Species Name	PGW	RW	Species Name	PGW	RW	Species Name	PGW	RW
Indigenous species			<u><i>Acacia melanoxylon</i></u>		✓	<i>Austrodanthonia eriantha</i>		-
<u><i>Acacia implexa</i></u>		✓	<i>Arthropodium strictum</i>	-		<i>Austrodanthonia fulva</i>		-
<u><i>Acacia mearnsii</i></u>		D	<i>Austrodanthonia bipartita</i>	-		<u><i>Austrodanthonia laevis</i></u>	✓	✓
			† <i>Austrodanthonia duttoniana</i>	-		<i>Austrodanthonia penicillata</i>	✓	✓

Species Name	PGW	RW	Species Name	PGW	RW	Species Name	PGW	RW
<i>Austrodanthonia racemosa</i>	✓	✓	<i>Wurmbea dioica</i> ^{AWC}		–	<i>Hypochoeris radicata</i>	✓	✓
<i>Austrodanthonia setacea</i>	✓	✓	Planted species			<i>Ipomoea</i> sp.		–
† <i>Austrostipa rudis</i> ssp. <i>nervosa</i>	M		<i>Acacia dealbata</i>	–	✓	<i>Iris foetidissima</i>		–
<i>Austrostipa rudis</i> subsp. <i>rudis</i>	✓	✓	<i>Acacia implexa</i>	✓		<i>Juncus articulatus</i>		✓
† <i>Bolboschoenus caldwellii</i>		–	<i>Acacia paradoxa</i>	–		<i>Juncus capillaceus</i>	–	–
<i>Bossiaea prostrata</i>	✓	–	<i>Acacia verticillata</i>		✓	<i>Leontodon taraxacoides</i>	✓	✓
<i>Burchardia umbellata</i>	–		<i>Goodenia ovata</i>	✓		<i>Lepidium africanum</i>	–	–
<i>Bursaria spinosa</i>	✓	D	<i>Solanum laciniatum</i>	✓		<i>Lepidium didymum</i>		–
<i>Carex breviculmis</i>	✓		<i>Viminaria juncea</i>	✓		<i>Ligustrum lucidum</i>		✓
<i>Cassinia arcuata</i>		–	Weed species			<i>Lolium perenne</i>		✓
<i>Cotula australis</i>		✓	<i>Acacia longifolia longifolia</i>		✓	<i>Malus pumila</i>		–
<i>Crassula decumbens</i>	M	✓	<i>Agapanthus praecox</i>	–	✓	<i>Malva</i> sp.		✓
<i>Dianella admixta</i>		–	<i>Agrostis capillaris</i>	M	✓	<i>Nassella neesiana</i>		✓
<i>Dianella longifolia</i> s.l.		–	<i>Allium triquetrum</i>		M	<i>Nasturtium officinale</i>		–
<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	–		<i>Anagallis arvensis</i>		✓	<i>Oxalis debilis</i>		–
<i>Drosera peltata</i> subsp. <i>peltata</i>	M		<i>Anthoxanthum odoratum</i>		D	<i>Oxalis pes-caprae</i>		M
<i>Elymus scaber</i>		–	<i>Arctotheca calendula</i>		–	<i>Paspalum dilatatum</i>	✓	✓
<i>Epilobium hirtigerum</i>	✓		<i>Aster subulatus</i>		✓	<i>Paspalum distichum</i>		✓
<i>Eragrostis brownii</i>	M	M	<i>Avena</i> sp.		✓	<i>Pennisetum clandestinum</i>	✓	M
<i>Eucalyptus camaldulensis</i>	D	✓	<i>Brassica fruticulosa</i>		✓	<i>Phalaris aquatica</i>		✓
<i>Eucalyptus melliodora</i>	✓	✓	<i>Briza maxima</i>	–	–	<i>Pittosporum undulatum</i>	–	–
<i>Eucalyptus ovata</i>		D	<i>Briza minor</i>	M	✓	<i>Plantago coronopus</i>	✓	✓
<i>Eucalyptus viminalis</i> (2 ssp.)		✓	<i>Bromus catharticus</i>	–	✓	<i>Plantago lanceolata</i>	M	✓
<i>Geranium solanderi</i> s.l.	–		<i>Bromus diandrus</i>	✓	M	<i>Plantago major</i>		✓
<i>Gonocarpus tetragynus</i>	M		<i>Bromus hordeaceus</i>	✓		<i>Poa annua</i>	✓	
<i>Haloragis heterophylla</i>	–		<i>Calystegia silvatica</i>		✓	<i>Poa pratensis</i>		✓
<i>Hypoxis hygrometrica</i> ^{AWC}	–		<i>Centaurium erythraea</i>	✓		<i>Polycarpon tetraphyllum</i>		✓
<i>Isolepis cernua</i> var. <i>cernua</i>		M	<i>Cerastium glomeratum</i>	✓		<i>Populus nigra</i> ‘Italica’		–
<i>Juncus bufonius</i>	✓		<i>Chlorophytum comosum</i>		✓	<i>Prunella vulgaris</i>	✓	
<i>Juncus gregiflorus</i>		✓	<i>Conyza sumatrensis</i>		✓	<i>Prunus cerasifera</i>	–	✓
<i>Juncus subsecundus</i>	–		<i>Coprosma repens</i>		✓	<i>Pseudoscleropodium purum</i>	D	
<i>Lepidosperma laterale laterale</i>	–		<i>Cordyline australis</i>		–	<i>Quercus robur</i>		✓
<i>Leptorhynchos tenuifolius</i>	✓		<i>Cotoneaster glaucophyllus</i>		✓	<i>Ranunculus repens</i>		✓
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	M	✓	<i>Cotoneaster pannosus</i>		✓	<i>Raphanus raphanistrum</i>		–
<i>Lomandra longifolia</i>	✓	M	<i>Crassula multicava</i>		✓	<i>Romulea rosea</i>		M
<i>Lunularia cruciata</i>		M	<i>Crataegus monogyna</i>		✓	<i>Rubus anglocandicans</i>		✓
<i>Luzula meridionalis</i>			<i>Crepis capillaris</i>	–	–	<i>Rumex conglomeratus</i>		✓
var. <i>densiflora</i>	–	–	<i>Cynodon dactylon</i>	✓	✓	<i>Rumex crispus</i>		✓
var. <i>meridionalis</i>	–	–	<i>Cyperus eragrostis</i>	✓	–	<i>Sagina apetala</i>		✓
<i>Melaleuca ericifolia</i>		D	<i>Cyperus tenellus</i>	✓	–	<i>Salix alba</i>		✓
<i>Microlaena stipoides</i>	D	✓	<i>Dactylis glomerata</i>		M	<i>Salix babylonica</i> s.l.		✓
<i>Microtis parviflora</i>	–		<i>Ehrharta erecta</i>	✓	✓	<i>Setaria parviflora</i>	✓	
<i>Muellerina eucalyptoides</i>	–		<i>Ehrharta longiflora</i>	M		<i>Solanum nigrum</i>	–	–
<i>Opercularia ovata</i>	–		<i>Elytrigia repens</i>	M		<i>Sonchus oleraceus</i>		✓
<i>Oxalis exilis/perennans</i>	M		<i>Eriobotrya japonica</i>		–	<i>Sporobolus africanus</i>	M	✓
<i>Persicaria decipiens</i>		✓	<i>Festuca arundinacea</i>	–	–	<i>Taraxacum officinale</i>	–	–
<i>Phragmites australis</i>		✓	<i>Festuca rubra</i>		✓	<i>Tradescantia fluminensis</i>		M
<i>Poa morrisii</i>	✓		<i>Foeniculum vulgare</i>		✓	<i>Trifolium repens</i>	✓	✓
<i>Schoenus apogon</i>	M		<i>Fraxinus angustifolia</i>	✓	M	<i>Ulex europaeus</i>	✓	✓
<i>Senecio quadridentatus</i>	–		<i>Fumaria</i> sp.		✓	<i>Vicia sativa</i>	✓	✓
<i>Solenogyne dominii</i>	–		<i>Galium aparine</i>		✓	<i>Viola odorata</i>		✓
<i>Thelymitra peniculata</i>	✓		<i>Gamochaeta purpurea</i>		–	<i>Vulpia bromoides</i>	✓	
<i>Themeda triandra</i>	D	–	<i>Helminthotheca echioides</i>		–	<i>Watsonia meriana bulbifera</i>		✓
<i>Tricoryne elatior</i>	M		<i>Holcus lanatus</i>	✓	M	<i>Zantedeschia aethiopica</i>		✓
? <i>Triglochin striata</i>		✓						

Habitat Scores

Habitat scoring by the 'habitat hectare' method (Section 2.3.4, page 13) was conducted within the four areas outlined in yellow and labelled as habitat score zones on the enlarged aerial photograph on page 247. The vegetation within each of these areas is fairly uniform in botanical composition and ecological condition, and two of the areas are so similar to each other that they were scored together.

Habitat score zone A contains 550 m² of Plains Grassy Woodland, with a limited amount of enrichment planting of indigenous species. The habitat score measured on 21/1/05 was 33%, the largest contributions being fifteen percentage points for understorey composition and five percentage points for both organic litter and tree canopy cover.

Habitat score zone B has two parts separated by mowed grass, each measuring 450 m². The vegetation could reasonably be regarded as belonging to Riparian Woodland, Floodplain Riparian Woodland or Plains Grassy Woodland, but the habitat score does not change, whichever EVC is adopted. The habitat score measured on 21/1/05 was 36%, the largest contributions being fifteen percentage points for understorey composition, six percentage points for recruitment and five percentage points for both organic litter and tree canopy cover.

Habitat score zone C contains 400 m² of young regrowth that regenerated following an ecological burn in autumn 2004. It is best regarded as regrowth of Plains Grassy Woodland, but the habitat score is insensitive to this. The habitat score measured on 21/1/05 was 30%, the largest contributions being ten percentage points for both understorey composition and recruitment, and seven percentage points for lack of weeds.

Large old trees

Two River Red Gums (*Eucalyptus camaldulensis*) and one Manna Gum (*Eucalyptus viminalis*) in Markham Reserve were found to qualify as large old trees according to the Department of Sustainability & Environment's criterion for Red Gum-dominated woodlands (i.e. trunk diameters of at least 0.8 m). These each have a yellow circle and a red circle around them on the aerial photograph on p. 119. The red circles represent both site boundaries and tree protection zones, with radii equal to eighteen times the diameter of the associated tree trunk, following the recommendation of Matheny and Clark (1998) for over-mature trees that are sensitive to root disturbance.



Site 26, Photo 1. The River Red Gum beside Markham Avenue, showing the tree's structure and the density of foliage in the crown (showing no dieback at the branch tips). *Photo taken 6/10/04.*



Site 26, Photo 2. A view into the crown of the tree in Photo 1, to better display the density of foliage. This crown was regarded by the author as being in good health. *Photo taken 6/10/04.*

The large River Red Gum next to Markham Reserve is depicted in photos 1 and 2 above. Its height is 18 metres and its diameter at breast height is 1.37m, suggesting an age measured in centuries. The tree is in good health. It has many hollows, including one occupied by feral honeybees in 2004-5.

The other River Red Gum, near Warrigal Rd in the reserve's northeastern corner, has a diameter at breast height of 0.81 m. It is in good health. It has some fissures in the trunk, which represent bat roosting sites, but no hollows were seen.

The Manna Gum near Warrigal Rd has a diameter at breast height of 0.84 m, and its health is again good. No hollows or fissures were seen.

A Silver Wattle (*Acacia dealbata*) marked on the upper aerial photograph on page 247 is worthy of note because it is extremely large and old for the Melbourne area, with a trunk diameter of 45 cm. However, this tree (and indeed, any wattle in Victoria) does not meet the Department of Sustainability & Environment's criterion for a 'large old tree'. The tree is in poor health.

Fauna of special significance

The significant fauna species in the list below have been observed at Markham Reserve. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Last Record
Melbourne	Boroondara		
Vulnerable	Vulnerable	Crested Pigeon	2005
	Endangered	Southern Bullfrog	2005
	Endangered	Spotted Pardalote	2005
	Vulnerable	Little Pied Cormorant	2005
	Vulnerable	White-faced Heron	2005
	Vulnerable	Australian Hobby	2001
	Vulnerable	Yellow-tailed Black-Cockatoo	2005
	Vulnerable	Musk Lorikeet	2005
	Vulnerable	Eastern Rosella	2005
	Vulnerable	Laughing Kookaburra	2005
	Occasional Visitor	Gang-gang Cockatoo	2004

Full fauna list

The following list shows the most recent year in which each species has been recorded, with 2004 or 2005 being from the present study. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies		Birds			
*Cabbage White	2005	Australian Wood Duck	2004	Red-rumped Parrot	2004
Australian Painted Lady	2005	†Pacific Black Duck	2005	Laughing Kookaburra	2005
Common Grass-blue	2005	Chestnut Teal	2005	Spotted Pardalote	2005
Yellow-banded Dart	2005	Little Pied Cormorant	2005	†Red Wattlebird	2005
		White-faced Heron	2005	Brush Wattlebird	2005
Fish		Australian White Ibis	2001	Noisy Miner	2005
*Carp	2005	Australian Hobby	2001	White-plumed Honeyeater	2001
		Dusky Moorhen	2001	Magpie-lark	2005
Frogs		*Spotted Turtle-Dove	2005	†Willie Wagtail	2005
Common Froglet	2005	Crested Pigeon	2005	Grey Butcherbird	2005
Southern Bullfrog	2005	Yellow-tailed Black-Cockatoo	2005	†Australian Magpie	2005
		Gang-gang Cockatoo	2004	Little Raven	2005
Mammals		Galah	2001	*House Sparrow	1988
Common Brushtail Possum	2005	Sulphur-crested Cockatoo	2004	Welcome Swallow	2005
Common Ringtail Possum	2005	Rainbow Lorikeet	2005	*Common Blackbird	2004
*Cat (feral)	1988	Musk Lorikeet	2005	*Common Starling	2005
		Eastern Rosella	2005	*Common Myna	2005

Bird census results

One twenty-minute bird census was carried out as part of the bird survey by David Lockwood on 1st October 2004. He recorded ten native species and one introduced species. The species with the highest counts were Noisy Miner (18), Magpie-lark (6), Rainbow Lorikeet (5) and Crested Pigeon (4). The abundance of the Noisy Miner represents a significant ecological imbalance, and threatens the welfare of the native vegetation through insect pests that tend to accompany dense Noisy Miner populations.

Fauna habitat

Five Gang Gang Cockatoos (*Callocephalon fimbriatum*) were seen feeding among the flowers of planted Yellow Gum (*Eucalyptus leucoxylon* 'Rosea') and the seed-laden gumnuts of planted Bushy Yate (*Eucalyptus leuhmannii*). The low numbers of taller eucalypts present probably account for the low number of Red Wattlebirds observed. A very high density of Noisy Miners (*Manorina melanocephala*) observed, (18 birds in 20 minutes) highlights the vegetation structure of the site, namely the rather open linear plantings and the scattered trees of the mown areas.

Crested Pigeons (*Ocyphaps lophotes*) were observed feeding on the grass in the reserve's open areas on every visit the author made to the reserve. There were sometimes other native species also on the grass, such as Willie Wagtail, and frequently Welcome Swallows (*Hirundo neoxena*) catching insects in flight above the open grass areas.

Gardiners Creek in the eastern part of the reserve was observed to harbour two species of frog and three species of duck, including Pacific Black Duck (*Anas superciliosa*) with 5 young. These observations were in areas less trafficked by walkers and dogs, whose presence is likely to be suppressing the diversity and numbers of native fauna in the reserve generally.

The Malvern Valley Golf Course across the creek provides a broad habitat area which is likely to maximise the number of bird species found in Markham Reserve that utilise open woodland. This may account for the pair of Red-rumped Parrots observed flying over.

Corridors

The author observed numerous birds flying along Gardiners Creek and settling in or beside the creek. The species involved included the White-faced Heron, Little Pied Cormorant, Spotted Pardalote and several duck species. This provides fairly strong evidence that Gardiners Creek functions as a corridor for some bird species.

Site significance ratings

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to a small section of this site (essentially, habitat score zone B).

Regionally threatened Ecological Vegetation Class

Both of the EVCs present at Markham Reserve are endangered, and as the habitat scores reported above were in the range 30-36%, the conservation significance level of the native vegetation in the southwest is 'High' by the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a).

According to BioSites criterion 3.2.3, **State** significance applies to any site with a 'remnant patch' whose conservation significance is High or Very High due to the presence of a threatened EVC. Although the native vegetation is fragmented by strips of mown lawn, the sections are sufficiently close together and with a sufficient total area (0.3 hectares) to be treated as a remnant patch.

Rare or threatened plants

Markham Reserve has viable populations of at least twelve plant species that are threatened in Boroondara, some of them abundant. Each such species gives the site **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

Most of the significant fauna listed above do not have viable populations that are supported wholly or largely by Markham Reserve. However, it appears that a group of four Crested Pigeons are resident, the reserve satisfying a large part of their habitat needs (with additional habitat in the Malvern Valley Golf Course). Any locally threatened species that has a viable population gives the site **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Encroachment of mowing into remnant vegetation, particularly around habitat score zone A on the enlarged aerial photograph.	Endangered EVCs; significant flora	Moderate to High	Current
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Angled Onion (<i>Allium triquetrum</i>), Sweet Vernal-grass (<i>Anthoxanthum odoratum</i>), Great Brome (<i>Bromus diandrus</i>), Cocks-foot (<i>Dactylis glomerata</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Yorkshire Fog (<i>Holcus lanatus</i>), 	All	Moderate to High	Current

Threat	Natural assets affected	Severity	When?
<p>Chilean Spear-grass (<i>Nassella neesiana</i>), Soursob (<i>Oxalis pes-caprae</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Ribwort (<i>Plantago lanceolata</i>), Moss (<i>Pseudoscleropodium purum</i>), Common Onion-grass (<i>Romulea rosea</i>), Weeping Willow (<i>Salix babylonica</i> s.l.), Indian Rat-tail Grass (<i>Sporobolus africanus</i>), Wandering Jew (<i>Tradescantia fluminensis</i>), Gorse (<i>Ulex europaeus</i>);</p> <ul style="list-style-type: none"> Moderately serious: Sallow Wattle (<i>Acacia longifolia</i> subsp. <i>longifolia</i>), Agapanthus (<i>Agapanthus praecox</i> subsp. <i>orientalis</i>), Brown-top Bent (<i>Agrostis capillaris</i>), Aster-weed (<i>Aster subulatus</i>), Turnip (<i>Brassica</i> sp.), Lesser Quaking-grass (<i>Briza minor</i>), Prairie Grass (<i>Bromus catharticus</i>), Common Centaury (<i>Centaureum erythraea</i>), Common Mouse-ear Chickweed (<i>Cerastium glomeratum</i> s.l.), Mirror-bush (<i>Coprosma repens</i>), Cotoneaster (<i>Cotoneaster glaucophyllus</i>), Shade Crassula (<i>Crassula multicava</i> subsp. <i>multicava</i>), Couch (<i>Cynodon dactylon</i>), Tiny Flat-sedge (<i>Cyperus tenellus</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Fennel (<i>Foeniculum vulgare</i>), unidentified fumitory (<i>Fumaria</i> sp.), Cleavers (<i>Galium aparine</i>), Cat's Ear (<i>Hypochoeris radicata</i>), Lear's Morning-glory (<i>Ipomoea indica</i>), Jointed Rush (<i>Juncus articulatus</i>), String Rush (<i>Juncus capillaceus</i>), Paspalum (<i>Paspalum dilatatum</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Buck's-horn Plantain (<i>Plantago coronopus</i>), Cherry-plum (<i>Prunus cerasifera</i>), Creeping Buttercup (<i>Ranunculus repens</i>), Common Vetch (<i>Vicia sativa</i>), Squirrel-tail Fescue (<i>Vulpia bromoides</i>), Bulbil Watsonia (<i>Watsonia meriana</i> var. <i>bulbillifera</i>), White Arum Lily (<i>Zantedeschia aethiopica</i>). 			
Inadvertent off-target damage from herbicide use within remnant ground flora. Some damage is unavoidable, but should be minimised.	Endangered EVCs; significant flora	Moderate	Current
Precariously small populations of some plant species, causing vulnerability to inbreeding or chance events.	Significant flora	Moderate	Current
Recreational activities: Trampling of vegetation by humans and their dogs.	Endangered EVCs; significant flora	Moderate	Current
Disturbance of wildlife by humans and dogs, which reduces the variety and numbers of native birds, reptiles and frogs.	Birds, reptiles and frogs	Moderate	Current
Overpopulation of the aggressive Noisy Miner, displacing other species and possibly contributing to eucalypt dieback and general ecological imbalance.	Endangered EVCs; birdlife; large old trees	Moderate	Current
Eucalypt dieback disease due to psyllids, leaf skeletonisers, leaf miners or galls. The damage is currently moderate and is likely to vary in intensity from time to time.	Endangered EVCs; birdlife; large old trees	Low to moderate	Current
Borer attack of wattles.	Endangered EVCs	Low to moderate	Current
Predation by foxes and cats.	Birds, reptiles and frogs	Low to moderate	Current
Occupation of tree hollows by pests such as feral bees and Common Mynas.	Hollow-dependent native fauna	Low to moderate	Current

Priority actions

- Mowing appears to be steadily encroaching uphill (northward) along the southern edge of habitat score zone A (drawn on the enlarged aerial photograph on page 247). Several sun-orchids and numerous sundews were mown in 2004 just before setting seed. Mowing should be withdrawn approximately two metres southward at the location where *Thelymitra peniculata* and three other significant plant species are marked on the aerial photograph. The edge of the

mowing will then more closely follow the contour of the land. A metal picket may be required in the short term to indicate where mowing is to cease.

2. Remove the serious weed, Chilean Needle-grass (*Nassella neesiana*), at the two locations beside Gardiners Creek marked on the enlarged aerial photograph on page 247, in November. Follow up in following Novembers until the species is confidently eradicated. The importance is moderate and the urgency is high.

Past management and revegetation

Markham Reserve was once almost completely cleared, leaving only three pre-European trees standing today. Most of the reserve has been a rubbish tip, but the site described here skirts around the former tip. The banks of Gardiners Creek have been substantially cleared, excavated and lined with rocks for erosion control, and partly planted with exotic species. The regrowth of indigenous vegetation was suppressed for many years by widespread mowing, as the reserve was managed to provide a parkland landscape with very open areas for recreation. Some Australian native trees were planted, particularly as the rubbish tip was decommissioned.

It appears that parts of the reserve became managed for conservation purposes during the 1990s. The conservation group, Greenlink Box Hill, documented the vegetation around 1992-3 and sought to have its significance given recognition in the management of the reserve.

A report by Ecology Australia in 1995 indicated that by that time, mowing had been withdrawn from some parts of the reserve and the subsequent rank growth of exotic species may have overrun some of the natural vegetation. This highlights the importance of keeping weed growth in check when an area is relieved from mowing.

In the last few years, the City of Boroondara has planted extensive revegetation along the riverbank (as marked on the aerial photograph on page 247). Council has also been managing the remnant ground flora more intensively, with extensive spot spraying, hand weeding and infill planting of indigenous species. Woody weeds and blackberry have also been controlled (as discussed further in the section about monitoring).

There was also an experimental burn conducted in April or May 2004 within (and slightly beyond) habitat score zone C on the enlarged aerial photograph on page 247. However, the fire intensity was too low to kill species such as *Paspalum* and the time of year favoured regrowth of the serious weed, Sweet Vernal-grass (*Anthoxanthum odoratum*), so the desired benefits of the burn have been only partly realised.

Future burns should be conducted in late spring (prior to seed-set by Sweet Vernal-grass) when there is enough dry fuel to provide adequate intensity (within the bounds of safety). Brushcutting a few weeks prior could be used to provide dry fuel. Burning should only occur in very favourable weather conditions: dry conditions in previous days, low to moderate humidity and a light wind (not still) directed away from the adjacent flats and houses.

Future revegetation

Future revegetation in Markham Reserve could fall into two categories: (a) to expand the area of habitat; or (b) to increase the numbers of species that are in precariously low numbers.

For category (a), planting should focus on connecting the presently fragmented patches of remnant native understorey; i.e. within the mown strips between the habitat score zones shown in the enlarged aerial photograph on page 247. Lists of suitable species are provided in Appendix C, as well as in Table 2 of the report by Ecology Australia Pty Ltd (1995). Those species with good sources of propagating material within the reserve are underlined in the section above headed 'Full flora list'.

For category (b), the highest priority species for planting to increase their numbers would be:

- *Burchardia umbellata*, *Elymus scaber*, *Leptorhynchos tenuifolius*, *Opercularia ovata* and *Solenogyne dominii*.

Propagating material for each of these five species should preferably be obtained from a nearby location to improve outbreeding. It would be ideal to exchange seed between Markham Reserve and the Welfare Parade railway corridor (within Site 30) for the first four species, and with the elevated section of Clifford Close Reserve (Site 25) for the *Solenogyne*. Planting into Markham Reserve should initially occur close to existing plants of those species, to maximise cross-pollination. Later plantings could be further away, to reduce the risk of localised, chance events (e.g. digging by a dog) from destroying all plants within the whole site.

Records should be kept of any planting done in this (or any other) site, including species, numbers and locations.

Quadrat Monitoring

The 1995 report on Markham Reserve by Ecology Australia Pty Ltd, for the City of Boroondara, included data from six quadrats. In principle, the quadrats would provide a good basis for comparison with contemporary data. However, relocating the quadrat locations is difficult because the map that was intended to indicate the quadrat locations could not be

obtained from Ecology Australia Pty Ltd or the City of Boroondara, and the coordinates stated in the report are so imprecise that only two of them correspond to locations inside the reserve (and those two quadrats are given identical coordinates).

Nevertheless, based on the particular plant species within Ecology Australia's quadrat data, the present author has inferred the likely location of two of the quadrats.

Quadrat E13943 in 1994, which measured 700 m², is very likely have included habitat score zone C (the area of 400 m² burned in autumn 2004), based on the presence of *Haloragis heterophylla* and the absence of any trees. Quadrat data was collected from habitat score zone C in 2005 and given the number N04085. Similarly, quadrat E13946 in 1995 appears to have embraced habitat score zone A, for which quadrat data were collected in 2005 (number N04084). The 1994-5 data and the 2005 data are tabulated side by side in the two tables below. The entries in the columns headed 1994/5 and 2005 are Braun-Blanquet categories of vegetation cover, as follows:

'+' = minor occurrence; '1' = <5% cover; '2' = 5-25% cover; '3' = 25-50% cover; '4' = 50-75% cover; '5' = >75% cover.

Habitat Score Zone A

Quadrat N04084 (550 m²) collected by GS Lorimer on 21/1/05, embraced by E13946 (700 m²) collected by AM Muir on 14/2/95. MGA coordinates 331155 m east, 5806580 m north.

Species Name	1995	2005	Species Name	1995	2005	Species Name	1995	2005
Wild indigenous species			<i>Oxalis exilis/perennans</i>	+	1	<i>Holcus lanatus</i>	1	1
<i>Acacia mearnsii</i>		2	<i>Poa morrisii</i>		+	<i>Hypochoeris radicata</i>	2	1
<i>Arthropodium strictum</i>		+	<i>Schoenus apogon</i>	+	1	<i>Juncus capillaceus</i>	1	
<i>Austrodanthonia ?duttoniana</i>	1		<i>Thelymitra peniculata</i>		+	<i>Leontodon taraxacoides</i>	2	
<i>Austrodanthonia laevis</i>	2		<i>Themeda triandra</i>	4	2	<i>Paspalum dilatatum</i>	2	1
<i>Austrodanthonia penicillata</i>		+	<i>Tricoryne elatior</i>	1	1	<i>Pennisetum clandestinum</i>	2	
<i>Austrodanthonia setacea</i>	1		Planted indigenous species			<i>Pitosporum undulatum</i>		+
<i>Austrostipa rudis</i>	2	1	<i>Acacia implexa</i>		1	<i>Plantago coronopus</i>	1	
<i>Bossiaea prostrata</i>		1	<i>Acacia paradoxa</i>		+	<i>Plantago lanceolata</i>	1	1
<i>Burchardia umbellata</i>		+	<i>Goodenia ovata</i>		1	<i>Poa annua</i>	1	
<i>Carex breviculmis</i>	1		Introduced species			<i>Poa pratensis</i>	1	
<i>Drosera peltata peltata</i>		1	<i>Agapanthus praecox</i>		+	<i>Prunella vulgaris</i>	1	
<i>Eragrostis brownii</i>	2		<i>Agrostis capillaris</i>	3	1	<i>Prunus cerasifera</i>	+	
<i>Eucalyptus camaldulensis</i>	3	3	<i>Anthoxanthum odoratum</i>	2	3	<i>Pseudoscleropodium purum</i>		5
<i>Gonocarpus tetragynus</i>		1	<i>Briza minor</i>	+		<i>Romulea rosea</i>	1	1
<i>Juncus subsecundus</i>		+	<i>Bromus catharticus</i>	+		<i>Setaria parviflora</i>	1	
<i>Leptorhynchus tenuifolius</i>	+	+	<i>Bromus hordeaceus</i>	1		<i>Sporobolus africanus</i>	1	+
<i>Lomandra filiformis coriacea</i>		1	<i>Centaurium erythraea</i>	1	+	<i>Trifolium repens</i>	1	
<i>Lomandra longifolia</i>		1	<i>Cynodon dactylon</i>	1		<i>Trifolium sp.</i>	+	
<i>Luzula meridionalis</i>	+	+	<i>Ehrharta erecta</i>		1	<i>Ulex europaeus</i>		1
<i>Microlaena stipoides</i>	1	1	<i>Elytrigia repens</i>	2		<i>Vulpia sp.</i>	1	
<i>Muellerina eucalyptoides</i>	+	+	<i>Fraxinus angustifolia</i>		1			
<i>Opercularia ovata</i>		+						

In the table above, *Acacia mearnsii* and *Lomandra longifolia* may have been planted.

The important conclusions from comparison of the 1995 and 2005 data are as follows:

- There has been a remarkable loss of the formerly abundant indigenous grass species, *Eragrostis brownii*. The loss of this species was also noticed in other parts of the reserve, e.g. Habitat Score Zone C. The author cannot explain this;
- Wallaby-grasses (*Austrodanthonia*) have apparently plummeted in numbers. This could be due to out-competition by the introduced moss, *Pseudoscleropodium purum*; however, the absence of the moss from the 1995 data could be just because most botanists cannot recognise it;
- It appears that the diversity of indigenous species has improved since 1995, particularly allowing for the smaller area surveyed in 2005. However, the Ecology Australia report indicates that species were probably not detected in February 1995 due to very dry conditions.
- There appears to have been a great change in the introduced species present, with an overall reduction in coverage and numbers of species except for the serious weed, *Ulex europaeus* (Gorse), which has infested the area. However, the

1995 quadrat was larger than the existing patch of native vegetation, so the extra weeds recorded in 1995 could be just because the recorder included areas of lawn.

Habitat Score Zone C

Quadrat N04085 (400 m²) collected by GS Lorimer on 21/1/05, embraced by E13943 (700 m²) collected by GW Carr on 24/12/94. MGA coordinates 331300 m east, 5806550 m north.

This quadrat was burned at low intensity in April or May 2004.

Species Name	1994	2005	Species Name	1994	2005	Species Name	1994	2005
Wild indigenous species			<i>Lomandra filiformis coriacea</i>		+	<i>Bromus catharticus</i>		+
<i>Acacia mearnsii</i>		1	<i>Lomandra longifolia</i>		+	<i>Centaureum erythraea</i>	1	
<i>Acacia melanoxylon</i>		+	<i>Microlaena stipoides</i>		1	<i>Cerastium glomeratum</i>		+
<i>Arthropodium strictum</i>		1	<i>Microtis parviflora</i>		+	<i>Cynodon dactylon</i>	1	+
<i>Austrodanthonia ?bipartita</i>	+		<i>Opercularia ovata</i>		+	<i>Cyperus tenellus</i>		1
<i>Austrodanthonia fulva</i>	1	+	<i>Schoenus apogon</i>	1	1	<i>Ehrharta longiflora</i>		1
<i>Austrodanthonia laevis</i>	1		<i>Thelymitra peniculata</i>		+	<i>Festuca rubra</i>	1	
<i>Austrodanthonia penicillata</i>		1	<i>Themeda triandra</i>	4	4	<i>Holcus lanatus</i>	1	+
<i>Austrodanthonia racemosa</i>	1		<i>Tricoryne elatior</i>		1	<i>Hypochoeris radicata</i>	2	1
<i>Austrostipa rudis</i>	+	1	Planted indigenous species			<i>Leontodon taraxacoides</i>	2	
<i>Burchardia umbellata</i>		+	<i>Acacia dealbata</i>		+	<i>Lepidium africanum</i>	+	
<i>Bursaria spinosa</i>		+	<i>Eucalyptus camaldulensis</i>		+	<i>Paspalum dilatatum</i>	1	1
<i>Carex breviculmis</i>	1		<i>Viminaria juncea</i>		1	<i>Pennisetum clandestinum</i>	1	
<i>Dianella longifolia</i> s.l.		+	Introduced species			<i>Plantago lanceolata</i>	1	1
<i>Drosera peltata</i> ssp. <i>peltata</i>		1	<i>Agrostis capillaris</i>	2	1	<i>Prunella vulgaris</i>	1	
<i>Eragrostis brownii</i>	2		<i>Anthoxanthum odoratum</i>		1	<i>Romulea rosea</i>	2	1
<i>Eucalyptus melliodora</i>		1	<i>Arctotheca calendula</i>		+	<i>Sporobolus africanus</i>	1	1
<i>Eucalyptus ovata</i>		+	<i>Briza maxima</i>	+		<i>Taraxacum officinale</i>	+	
<i>Haloragis heterophylla</i>	+	1	<i>Briza minor</i>	1	1	<i>Trifolium repens</i>	+	
<i>Juncus bufonius</i>		1				<i>Vulpia bromoides</i>	1	1

In the table above, the first three species may have been planted.

The important conclusions from comparison of the 1994 and 2005 data are as follows:

- The above data confirms the loss of *Eragrostis brownii* discussed in relation to the previous quadrat;
- *Haloragis heterophylla*, which is otherwise present in Boroondara only in Yarra Bend Park, has increased in cover between 1994 and 2005, so the fire certainly did not harm it and may have benefited it;
- The diversity of indigenous species has improved since 1994, particularly allowing for the smaller area surveyed in 2005. Two of the species that were recorded in 1994 but not in the 2005 data above (namely *Austrodanthonia laevis* and *A. racemosa*) were nevertheless recorded just outside the 2005 quadrat, and have therefore not really been lost.
- There appears to have been a great change in the introduced species present, with an overall reduction in coverage and numbers of species. However, as in the case of the previous quadrat, the 1994 quadrat was larger than the existing patch of native vegetation, so the extra weeds recorded in 1994 could be just because the recorder included areas of lawn.
- The previous four bullet points suggest that the ecological burn of autumn 2004 was successful. However, this conclusion should be tempered with caution because the increase in the high-risk weeds, *Anthoxanthum odoratum* and *Ehrharta longiflora*, may undo the good that has been done. A spring burn could have reduced the risk of this happening.

Other monitoring

Vegetation condition

The report by Ecology Australia Pty Ltd (1995, p. 8) refers to a 'Map 1' that showed the ecological condition of the native vegetation. Unfortunately, the map could not be obtained from Ecology Australia or the City of Boroondara, so it could not be compared with the current state.

Dieback

The report by Ecology Australia Pty Ltd (1995, p. 11) mentions that at that time, several River Red Gums and one Yellow Box had dieback, but not the remaining trees. In 2005, there are clear signs of dieback in Swamp Gums as well (Photo 3 below), some of it attributable to borer damage some years ago.

We can therefore infer that dieback is not a recent phenomenon at Markham Reserve, and that the trees affected have varied over the years (as is normal). It is not possible to tell whether there has been a change in the severity of dieback. The photographs presented here (particularly Photos 1 and 2 on page 252 and Photo 3 on page 260) should allow change to be detected better in future; however, allowance should be made for large inter-annual fluctuations in dieback.

Weeds

Table 3 of the 1995 Ecology Australia Pty Ltd report provided a list of 'the most serious environmental weed species requiring elimination from remnant indigenous vegetation'. Some of the species listed were probably not part of indigenous vegetation, and some (e.g. Pin Oak, *Quercus palustris*) were probably only present as planted specimens or with very little reproduction. This makes it hard to compare Ecology Australia Pty Ltd's weed ratings with those assigned in the present study, in which species like the Pin Oak example are not deemed among 'the most serious' in the reserve.

Nevertheless, Ecology Australia Pty Ltd included some species in the list that would inevitably have represented a high ecological threat, and which were not observed at all in the native vegetation in 2004-5. These species include Blackberry (*Rubus anglocandicans*), Hawthorn (*Crataegus monogyna*) and Toowoomba Canary-grass (*Phalaris aquatica*). We can therefore conclude that there has been excellent success with some very serious and persistent weed species.

Other

The following items have been gathered to provide a baseline for future monitoring:

- Plant lists for six parts of the site, summarised beneath the heading 'Full flora list' above and stored in detail in this study's database. Repeat every four years or so. Check for loss or decline of indigenous species and shifts in abundances of weeds;
- Ratings of weed severity within each part of the site, also stored in this study's database. Check in conjunction with the previous item;
- Tree health ratings, as discussed in the section above headed 'Large old trees'. Check every one to two years;
- The habitat scores that were determined for each of the three zones discussed above. Repeat every two to four years and check for changes in habitat score and the reasons why they have occurred. The original field data sheets from this study are available separately;
- Population sizes of scarce plant species, as indicated in the section headed 'Flora of special significance'. Locations of these species in 2005 are shown on the aerial photographs on page 247. Check the populations every two to four years, noting that shorter-lived species are likely to disappear from existing locations and appear elsewhere;
- Bird survey, including a twenty-minute bird census. Repeat in spring every two to four years. Check for changes in the abundance of birds, the particular species present and the species that are breeding;
- The monitoring photographs displayed below, with locations and orientations shown on the enlarged aerial photograph on page 247. Original digital images are available separately. Repeat the photographs about every two years, checking for weed growth and the features mentioned in the captions. Photographs taken by Ecology Australia Pty Ltd for their 1995 report could not be obtained from them or the City of Boroondara.

Monitoring photographs for Markham Reserve

The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 247.



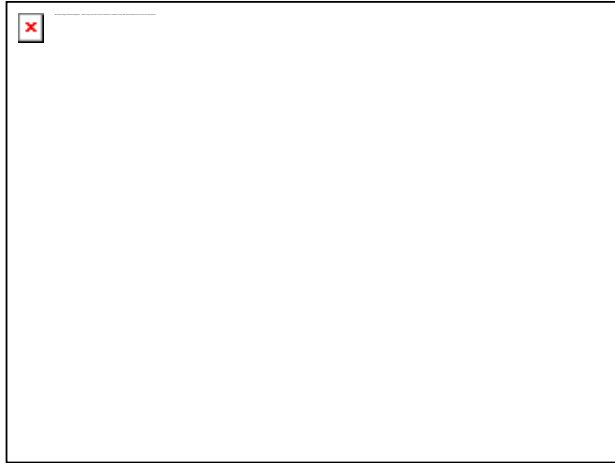
Site 26, Photo 3. An eastward view from the eastern end of habitat score zone C. The eucalypts with dieback were found to have mild insect attack of leaves and old borer tracks in the wood. An overpopulation of Noisy Miners may be contributing to the dieback. *Photo taken 21/10/04.*



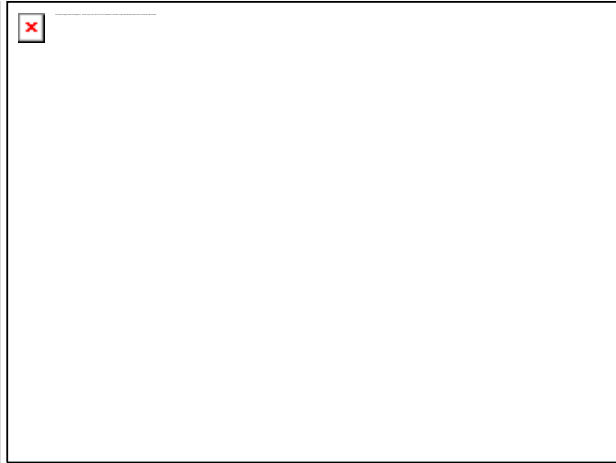
Site 26, Photo 4a. Looking east-southeast from the western tip of the patch of *Haloragis heterophylla* in habitat score zone C. This photo was taken on 6/10/04 and shows the new growth following burning five months prior.



Site 26, Photo 4b. As for Photo 4a, but the photograph taken on 21/1/05 to demonstrate the density of *Themeda triandra*, *Anthoxanthum odoratum* and *Paspalum dilatatum* at the peak of their seeding. The area of less dense grass in the left foreground is the patch of *Haloragis heterophylla*.



Site 26, Photo 5. An eastward view through the western segment of habitat score zone B, to show the structure of the vegetation and the effect of the path (which is recommended to be narrowed). *Photo taken 21/1/05.*



Site 26, Photo 6. A view across habitat score zone A from just outside its western edge, to show the vegetation structure and the density of grasses, particularly *Microlaena*, *Themeda* and *Anthoxanthum*. *Photo taken 21/1/05.*

Information sources used in this assessment

- A brief site inspection by Dr Lorimer on 6th September 2004 with Council staff;
- A vegetation and habitat survey by Dr Lorimer for a total of fifteen hours and twenty minutes on 6/10/04, 21/10/04, 21/1/05 and 21/2/05, using this study's standard approach described in Section 2.3. This included:
 - Description of the structural and floristic composition of four distinct areas of native vegetation with understorey;
 - Compilation of lists of indigenous and introduced plant species in each of six parts of the site, including the species' abundances and the threat level of all weed species in each area;
 - Assessment and documentation of quadrats N04084 and N04085;
 - Determination of three habitat scores, two of which are associated with the abovementioned quadrats;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Individual measurement and health assessment of large old trees;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- A daytime bird survey of the site by David Lockwood on 1/10/04 according to the protocol discussed in Section 2.4.1, including a twenty-minute bird census;
- Spotlighting by Dr Lorimer for twenty minutes on 31/1/05;
- The City of Boroondara's copy of a report prepared for them by Ecology Australia Pty Ltd, evidently in 1995, titled '*Indigenous Vegetation of Markham Reserve, Ashburton*'. This copy is missing 'Map 1', 'Quadrat 4' and all of the intended photographs. Some of the species listed in the quadrat data in the report do not appear in the Department of Sustainability & Environment's version of the same data, presumably due to quality control. Attempts to obtain a complete copy of the report or clarification of anomalies were unsuccessful;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

Once Geoff Carr has prepared an identification key for the *Dianella longifolia* group, the key should be used to refine the identity of whatever *Dianellas* remain in Markham Reserve. Only one wild individual was found in the present study, its location marked on the enlarged aerial photograph on page 247.

It is likely that several plant species have been overlooked due to seasonal factors; e.g. *Wurmbea dioica* and *Hypoxis*. Ideally, an inspection would be made in future springtimes to fill any gaps in the data and determine whether any additional areas need to be carefully managed for rare species. There should be a focus on the area near the cricket nets.

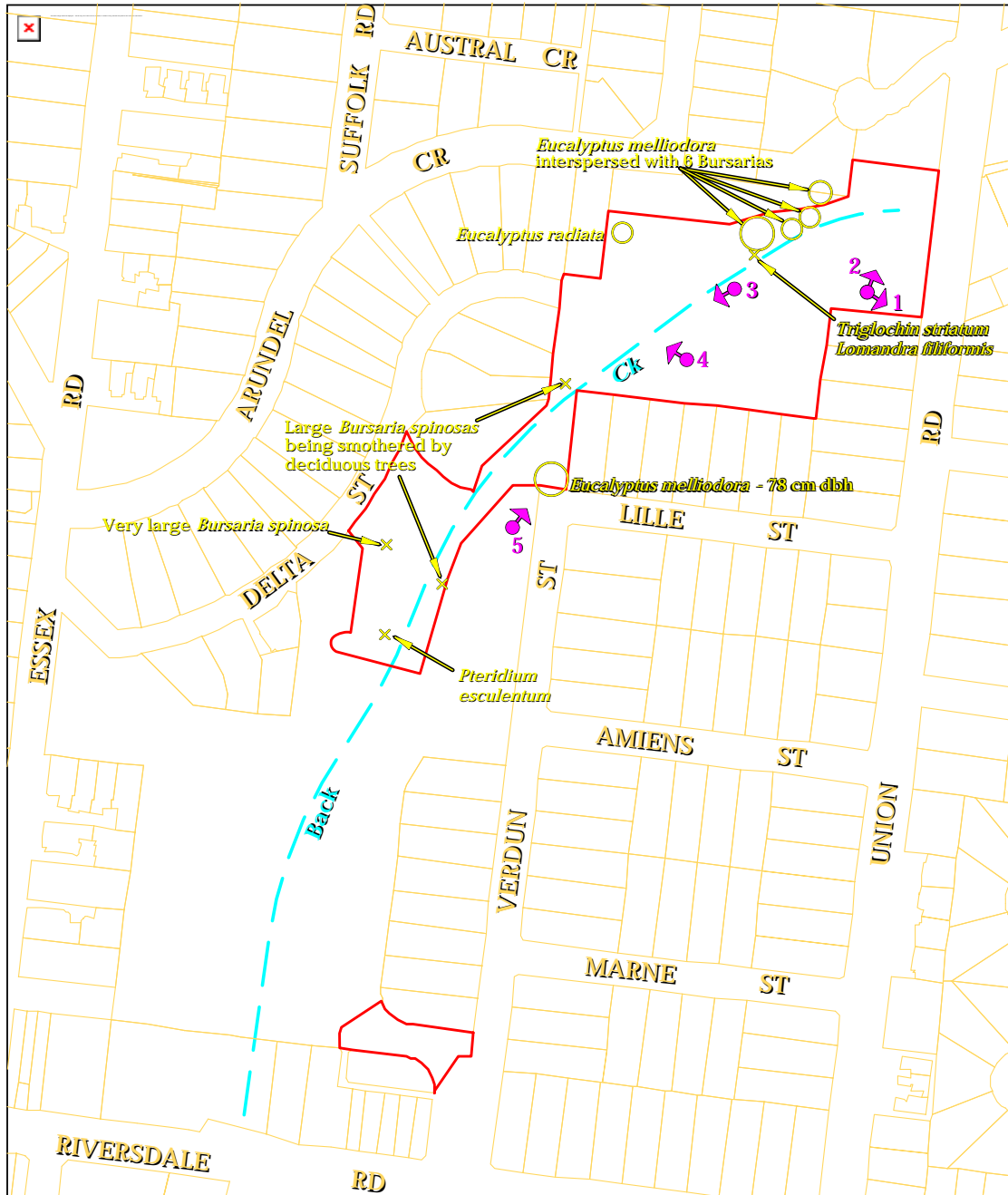
Site 27. South Surrey Park, Surrey Hills

A section of Back Creek, its riverbank and adjacent remnant vegetation, plus revegetation. Melway ref. 60 G1.

Site Biological Significance Level: *Local*

Summary of the most significant natural assets:

- Vestiges of the threatened Ecological Vegetation Classes, Valley Grassy Forest and Creekline Herb-rich Woodland;
- Apparently viable populations of five or six plant species that are threatened in Boroondara, some of them abundant;
- There appears to be a functional wildlife corridor along Back Creek, with the park representing a node.



 Numbered Photo Point



Scale 1:3,000
0 25 50 75 100 125 m

Boundaries

This site of biological significance comprises the two polygons outlined in red on the aerial photograph above. The boundaries follow cadastral boundaries as far as practicable.

Land use & tenure

City of Boroondara reserve, for drainage, amenity, recreation and conservation.

Physical features

Site area: 1.9 hectares in the larger polygon and 0.1 hectares in the smaller polygon (near Riversdale Rd).

Elevation: 66 m – 80 m.

Landform: Minor creek and lower valley slopes. The height from the creek's normal water level to the top of the channel is mostly much less than one metre, a small fraction of the corresponding dimensions for the Yarra River, Gardiners Creek or more downstream sections of Back Creek.

Slope: The site's southern polygon has a west-facing slope with gradient of 1:7. The slope for the remainder of the site varies in steepness from 1:1.5 (adjacent to the playground) to 1:10 (the area backing onto the houses in Lille St). The watercourse itself has a fall of approximately 5 m from Union Rd to Riversdale Rd, a gradient of 1%.

Soil type: There appears to be a small area of shallow alluvium just upstream (northeast) of the narrow neck in the site's northern polygon. Otherwise, the soil is thin, light grey loam topsoil with clay subsoil.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek Formation, which comprises siltstones interbedded with thin sandstones.

Site description

South Surrey Park is located on Back Creek near its headwaters, although Melbourne Water refer to this arm of the creek as the Nicholtsdale Rd Drain. The park was cleared of indigenous trees long ago, but there are five Yellow Box trees (*Eucalyptus melliodora*) and one Narrow-leafed Peppermint (*Eucalyptus radiata*) that either survived the clearing or have regenerated and reached maturity since. The largest Yellow Box (depicted on page 271) has a trunk diameter of 78cm, which is very large for that species in the Melbourne area. There are also some exceptionally large, old specimens of the indigenous shrub, Sweet Bursaria (*Bursaria spinosa*), and a Lightwood (*Acacia implexa*) on the Union Rd embankment that is probably natural. These eucalypts, bursarias and the Lightwood are the only indigenous woody plants growing wild in the park, but they have been augmented in recent years by extensive revegetation with indigenous species.

The diversity of indigenous ground flora in the park is somewhat greater, with approximately eighteen wild species remaining. This includes Boroondara's only known plant of Streaked Arrow-grass (*Triglochin striatum*) and the only plant of Austral Bracken (*Pteridium esculentum*) in Boroondara outside Yarra Bend Park. Most of the remnant ground flora occurs within a few metres of the creek.

The City of Boroondara and the Friends of South Surrey Park have been very active in revegetating approximately 7,000 m² of the park with a diverse array of species, from wildflowers and grasses to canopy trees. The largest expanse of revegetation abuts Union Rd. Despite the intention of planting only indigenous species, a small number of non-indigenous plants have appeared, variously due to nursery contamination, mistaken identity and confusion about what might once have grown on the site. Some of the revegetation plants are reproducing naturally, and *Einadia nutans* even has to be kept in check to prevent it smothering some low wildflowers.

The site's southern polygon, near the entrance from Verdun St, has no remnant vegetation but is included as part of the site of significance defined here because it is an excellent example of indigenous revegetation, with enough diversity of species to represent a substantial contribution toward the conservation of local flora and fauna. This is one of few places where one can find natural reproduction of delicate indigenous wildflowers that have been planted.

Ecological links with other land

South Surrey Park is rather disconnected from other areas of natural habitat. This represents a risk to the viability of the park's indigenous flora and fauna, because there is insufficient habitat in the park for most species to persist indefinitely in isolation from other habitat or members of their species. Management of the park's indigenous vegetation should recognise and counter the risk of plant inbreeding.

The sections of Back Creek upstream and downstream of South Surrey Park retain very little native vegetation and it appears superficially unlikely that Back Creek could function as a wildlife corridor, except perhaps for Shortfin Eel. However:

- David Lockwood observed a single individual of the nomadic Yellow-faced Honeyeater moving upstream along the creek. Some other migratory or nomadic species, such as Pink Robin and Horsfield's Bronze-cuckoo, have been

observed recently a few hundred metres downstream of South Surrey Park in Site 28. It seems most likely that these birds travelled to this neighbourhood via Back Creek, given the very poor habitat on any other approach;

- The author observed a Brown Goshawk cruising along the creek; and
- Observations by local bird observer, Eleanor Stephenson, indicate that the Brown Goshawk is seen regularly along the creek. It is quite possible that the same Brown Goshawk(s) account for the sightings of that species further down Back Creek at Nettleton Park Reserve in Glen Iris (Site 21).

The Grey Fantail observed in South Surrey Park during this study would also have to travel outside the park to satisfy its full habitat needs, and the fragmented corridor along Back Creek seems the most likely route for doing so.

On the basis of all the above bird observations and knowledge of the surrounding vegetation, South Surrey Park appears to be a node on a functioning wildlife corridor.

Wattle Park, 600 m to the east-southeast, is the nearest substantial area of native habitat with understorey. Without Wattle Park, there would probably be less diversity of birds and flying insects at South Surrey Park.

Habitat types

Perennial Stream (No EVC number).

The waterway may provide habitat for hardy fish such as the Shortfin Eel, and other aquatic fauna. No submerged plants were detected.

Valley Grassy Forest (EVC 47, **vulnerable** in the Gippsland Plain bioregion)

This EVC is represented by a small number of scattered eucalypts and small patches of understorey, plus revegetation. Fifteen wild indigenous plant species were found.

Canopy trees: Five *Eucalyptus melliodora* and one *Eucalyptus radiata*, all mapped on the aerial photograph.

Lower trees: *Acacia implexa* is scattered thinly, and at least one of these appears to be wild.

Shrubs: There are twelve *Bursaria spinosa* plants, some of which are uncommonly large with trunk diameters up to 26 cm. All other indigenous shrubs have been cleared.

Vines: None.

Ferns: One patch of *Pteridium esculentum*, the only plant of this species in Boroondara outside Yarra Bend Park.

Ground flora: Within lawn, the author found moderate numbers of *Austrodanthonia racemosa*, *Microlaena stipoides* and *Oxalis perennans/exilis*, and one plant of *Solenogyne gunnii*. *Juncus bufonius* is seasonally abundant in revegetation plots and the lawns. There is a single wild plant of each of *Lomandra longifolia* and *Lomandra filiformis* subsp. *coriacea*.

Creepline Herb-rich Woodland (EVC 164, **endangered** in the Gippsland Plain bioregion)

This EVC is represented by only twelve wild indigenous plant species growing within a few metres of the creek, just upstream of the narrow neck in the site's northern polygon.

Canopy trees: The crowns of some *Eucalyptus melliodora* from the Valley Grassy Forest overhang the Creepline Herb-rich Woodland. *Eucalyptus ovata* may once have been present, and this species has been planted recently.

Lower trees: There are no indigenous lower trees. *Melaleuca ericifolia* was probably once present, and has been planted recently.

Shrubs: Some *Bursaria spinosa* plants grow at the interface between Valley Grassy Forest and Creepline Herb-rich Woodland.

Vines and ferns: None.

Ground flora: The characteristic indigenous shrubby herb, *Senecio minimus*, is abundant. The remaining indigenous ground flora are strongly concentrated at the edge of the creek, dominated by *Juncus sarophorus* and *Isolepis inundata*, and with scattered plants of *Epilobium hirtigerum*, *Glyceria australis*, *Isolepis cernua*, *Juncus bufonius*, *Lachnagrostis filiformis* and *Lythrum hyssopifolia*. *Triglochin striatum* is represented by a single patch.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. Most of the species present in small numbers are mapped on the aerial photograph. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Notes
Critically Endangered	<i>Pteridium esculentum</i>	One patch, almost unique in Boroondara.
Critically Endangered	<i>Triglochin striatum</i> (flat leaf variant)	One patch, the only known plant in Boroondara.

Conservation Status in Boroondara	Species Name	Notes
Critically Endangered	<i>Eucalyptus radiata</i>	One tree, near Anderson St.
Endangered	<i>Glyceria australis</i>	Scattered beside the creek.
Endangered	<i>Lomandra longifolia</i>	One plant is wild, probably all others are planted.
Endangered	<i>Senecio minimus</i>	Abundant.
Endangered	<i>Solenogyne gunnii</i>	One plant in lawn near the <i>Eucalyptus radiata</i> .
Vulnerable	<i>Isolepis cernua</i> var. <i>platycarpa</i>	Scattered beside the creek.
Vulnerable	<i>Isolepis hookeriana</i>	Scattered beside the creek.
Vulnerable	<i>Isolepis inundata</i>	Abundant along the creek.
Vulnerable	<i>Eucalyptus melliodora</i>	Five trees, mapped on the aerial photo.

Full flora list

The species found in South Surrey Park by the author on 10/12/04 and 16/12/04 are listed below, with a column headed 'VGF' for species of the Valley Grassy Forest and a column headed 'CHW' for species of the Creekline Herb-rich Woodland. In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Underlining indicates species that represent a valuable source of propagating material. The Friends of South Surrey Park have a list of planted species that includes some species not noticed by the author (who did not thoroughly check all planted plants).

Species Name	VGF	CHW	Species Name	VGF	CHW	Species Name	VGF	CHW
Wild indigenous species			<i>Acacia mearnsii</i>	✓		<i>Goodia lotifolia</i>	✓	
<i>Acacia implexa</i>	-		<i>Acacia melanoxylon</i>		✓	<i>Gynatrix pulchella</i>	✓	
<i>Austroanthonia racemosa</i>	✓		<i>Acacia myrtifolia</i>	✓		<i>Hardenbergia violacea</i>	✓	
<i>Bursaria spinosa</i>	✓		<i>Acacia paradoxa</i>	✓		<i>Indigofera australis</i>	✓	
<i>Epilobium billardierianum</i>	✓		<i>Acacia pycnantha</i>	✓		<i>Juncus amabilis</i>		✓
subsp. <i>cinereum</i>			<i>Acacia verticillata</i>	✓	✓	<i>Juncus pallidus</i>		✓
<i>Epilobium hirtigerum</i>	✓	✓	<i>Acaena novae-zelandiae</i>	✓	✓	<i>Juncus pauciflorus</i>		✓
<i>Eucalyptus melliodora</i>	✓		<i>Allocasuarina littoralis</i>	✓		<i>Kennedia prostrata</i>		✓
<i>Eucalyptus radiata</i>	-		<i>Arthropodium milleflorum</i>	✓		<i>Kunzea ericoides</i> s.l.	✓	✓
<u><i>Glyceria australis</i></u>		✓	<i>Arthropodium strictum</i>	✓		<i>Leptospermum lanigerum</i>		✓
<u><i>Isolepis cernua</i> var. <i>platycarpa</i></u>		✓	<i>Austroanthonia fulva</i>	✓		<i>Leptospermum scoparium</i>		✓
<u><i>Isolepis hookeriana</i></u>		✓	<i>Austroanthonia racemosa</i>	✓	✓	<i>Lomandra filiformis coriacea</i>	✓	
<u><i>Isolepis inundata</i></u>		M	<i>Austroanthonia setacea</i>	✓	✓	<i>Lomandra longifolia</i>	✓	✓
<u><i>Juncus bufonius</i></u>	M	✓	<i>Banksia integrifolia</i>	✓		<i>Mazus pumilio</i>		✓
<u><i>Juncus sarophorus</i></u>		M	<i>Banksia marginata</i>		✓	<i>Melaleuca ericifolia</i>		✓
<i>Lachnagrostis filiformis</i>		✓	<i>Brachyscome multifida</i>	✓		<i>Microlaena stipoides</i>	✓	
<i>Lomandra longifolia</i>	-		<i>Bursaria spinosa</i>	✓		<i>Olearia lirata</i>		✓
<i>Lythrum hyssopifolia</i>	✓	✓	<i>Callistemon sieberi</i>		✓	<i>Patersonia occidentalis</i>	✓	✓
<i>Microlaena stipoides</i>	✓		<i>Carex appressa</i>	✓	✓	<i>Pelargonium australe</i>	✓	
<i>Oxalis exilis/perennans</i>	✓		<i>Cassinia aculeata</i>	✓		<i>Poa ensiformis</i>		✓
<i>Portulaca oleracea</i>		✓	<i>Cassinia longifolia</i>	✓		<i>Poa labillardierei</i>	✓	✓
<i>Pteridium esculentum</i>	✓		<i>Centella cordifolia</i>		✓	<i>Pomaderris aspera</i>	✓	✓
<u><i>Senecio minimus</i></u>	-	M	<i>Chrysocephalum apiculatum</i>	✓		<i>Solanum laciniatum</i>	✓	✓
<i>Solenogyne gunnii</i>	-		<i>Chrysocephalum semipapposum</i>	✓		<i>Themeda triandra</i>		✓
<u><i>Triglochin striatum</i></u> (flat leaf)		✓	<i>Clematis microphylla</i>	✓		<i>Viminaria juncea</i>	✓	✓
Indigenous, of uncertain origin			<i>Coprosma quadrifida</i>	✓		<i>Wahlenbergia gracilis</i>	✓	
<i>Acacia melanoxylon</i>	✓		<i>Correa reflexa</i>	✓		<i>Wahlenbergia stricta</i>	✓	
<i>Coprosma quadrifida</i>		✓	<i>Dianella longifolia</i> s.l.		✓	Planted non-indigenous species		
<i>Crassula helmsii</i>		✓	<i>Dianella revoluta</i>	✓		<i>Acmena smithii</i>		✓
<i>Lomandra filiformis coriacea</i>	-		<i>Dichelachne crinita</i>	✓		<i>Austroanthonia duttoniana</i>	✓	
Planted indigenous species			<i>Dichondra repens</i>	✓		<i>Austrostipa</i> spp. (basalt plains)	✓	
<i>Acacia acinacea</i>	✓		<i>Einadia nutans</i>	✓	✓	<i>Carex tereticaulis</i>		✓
<i>Acacia dealbata</i>		✓	<i>Eucalyptus camaldulensis</i>		✓	<i>Callistemon sieberi</i>	✓	✓
<i>Acacia genistifolia</i>	✓		<i>Eucalyptus melliodora</i>	✓		<i>Ficinia nodosa</i>		✓
<i>Acacia implexa</i>	✓		<i>Eucalyptus ovata</i>		✓	<i>Melicytus dentatus</i>	✓	
			<i>Eucalyptus viminalis viminalis</i>	✓	✓	<i>Salix matsudana</i> 'Tortuosa'		✓
			<i>Goodenia ovata</i>	✓	✓			

Species Name	VG	GF	CH	HW	Species Name	VG	GF	CH	HW	Species Name	VG	GF	CH	HW
Weed species					<i>Erigeron karvinskianus</i>				✓	<i>Ranunculus repens</i>				✓
<i>Agrostis capillaris</i>				✓	<i>Festuca rubra</i>	✓			✓	<i>Rumex conglomeratus</i>				✓
<i>Anagallis arvensis</i>	✓			✓	<i>Fraxinus angustifolia</i>				✓	<i>Rumex crispus</i>				✓
<i>Arctotheca calendula</i>				✓	<i>Galium aparine</i>	✓			✓	<i>Sagina apetala</i>				✓
<i>Aster subulatus</i>				✓	<i>Hedera helix</i>				✓	<i>Salix babylonica</i>				✓
<i>Callitriche stagnalis</i>				✓	<i>Holcus lanatus</i>				✓	<i>Salix fragilis</i>				✓
<i>Cardamine ?hirsuta</i>				✓	<i>Hypochoeris radicata</i>				✓	<i>Salix ×reichardtii</i>				✓
<i>Centaurium erythraea</i>	✓				<i>Leontodon taraxacoides</i>				✓	<i>Solanum pseudocapsicum</i>				✓
<i>Cerastium glomeratum</i>				✓	<i>Ligustrum lucidum</i>				✓	<i>Soleirolia soleirolii</i>				✓
<i>Cirsium vulgare</i>				✓	<i>Lolium perenne</i>				✓	<i>Sonchus asper</i>				✓
<i>Conium maculatum</i>				✓	<i>Lonicera japonica</i>				✓	<i>Sonchus oleraceus</i>	✓			✓
<i>Conyza sumatrensis</i>				✓	<i>Myosotis</i> sp.				✓	<i>Tradescantia fluminensis</i>				✓
<i>Coprosma repens</i>				✓	<i>Nasturtium officinale</i>				✓	<i>Trifolium dubium</i>				✓
<i>Crataegus monogyna</i>				✓	<i>Pittosporum undulatum</i>				✓	<i>Trifolium repens</i>				✓
<i>Cyperus eragrostis</i>				✓	<i>Plantago lanceolata</i>				✓	<i>Ulmus</i> aff. <i>procera</i>				✓
<i>Cyperus tenellus</i>				✓	<i>Plantago major</i>				✓	<i>Vicia hirsuta</i>	✓			
<i>Delairea odorata</i>				✓	<i>Poa annua</i>				✓	<i>Vulpia bromoides</i>	✓	✓		
<i>Echinochloa crus-galli</i>				✓	<i>Polycarpon tetraphyllum</i>	✓	✓			<i>Vulpia myuros</i>	✓			
<i>Ehrharta erecta</i>	✓	✓			<i>Prunella vulgaris</i>	✓	✓			<i>Zantedeschia aethiopica</i>				✓
<i>Ehrharta longiflora</i>				✓	<i>Prunus cerasifera</i>				✓					
<i>Epilobium ciliatum</i>	✓	✓			<i>Quercus robur</i>				✓					

Fauna of special significance

The significant fauna species in the list below have been observed at South Surrey Reserve. The Marbled Gecko and Gang-gang Cockatoo records are from 1991, and all others are from this study in 2004. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Conservation Status		Species Name
Melbourne	Boroondara		Melbourne	Boroondara	
Rare	Endangered	Marbled Gecko	Vulnerable	White-browed Scrubwren	
	Endangered	Spotted Pardalote	Vulnerable	Eastern Spinebill	
	Vulnerable	Brown Goshawk	Vulnerable	Golden Whistler	
	Vulnerable	Musk Lorikeet	Vulnerable	Grey Fantail	
	Vulnerable	Eastern Rosella	Occasional Visitor	Gang-gang Cockatoo	
	Vulnerable	Laughing Kookaburra	Occasional Visitor	Yellow-faced Honeyeater	

Full fauna list

The following list shows the most recent year in which each species has been recorded. Records dated 2004 are from the author or David Lockwood, as part of this study. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies		Birds		Yellow-faced Honeyeater	2004
*Cabbage White	2004	†Pacific Black Duck	2004	White-plumed Honeyeater	1988
Australian Painted Lady	2004	Brown Goshawk	2004	Eastern Spinebill	2004
Common Brown	2004	*Spotted Turtle-Dove	2004	Golden Whistler	2004
Common Grass-blue	2004	Gang-gang Cockatoo	1991	Magpie-lark	2004
Yellow-banded Dart	2004	Rainbow Lorikeet	2004	Grey Fantail	2004
		Musk Lorikeet	2004	Grey Butcherbird	2004
Reptiles		Eastern Rosella	2004	Australian Magpie	2004
Marbled Gecko	1991	Laughing Kookaburra	2004	Little Raven	2004
		Spotted Pardalote	2004	Silvereye	2004
Mammals		White-browed Scrubwren	2004	*Common Blackbird	2004
Common Brushtail Possum	2004	Brown Thornbill	2004	*Common Starling	2004
Common Ringtail Possum	2004	†Red Wattlebird	2004	*Common Myna	2004
*Red Fox	2004	Brush Wattlebird	2004		

Bird census results

One twenty-minute bird census was carried out as part of the bird survey by David Lockwood on 6th October 2004. He recorded twelve native species and three introduced species. The species with the highest counts were Common Blackbird (14), Red Wattlebird (8), White-browed Scrubwren (6) and Spotted Turtle-dove (6). The abundance of blackbirds and doves reflects the abundance of European vegetation in the area. The abundance of Red Wattlebirds represents an ecological imbalance that is suppressing smaller native birds, possibly leading to tree decline.

Fauna habitat

The planted eucalypts at this site are utilised by the Spotted Pardalote, despite the reasonably high numbers of Red Wattlebirds present. This could be due to the comparatively high numbers of eucalypts and low leafy shrubs present, the latter favouring small bird species such as scrubwrens rather than the Red Wattlebird. Additionally, no Noisy Miners were observed that would chase away the Spotted Pardalote, but this situation may change as the planted eucalypts mature.

Red Wattlebirds were observed using indigenous habitat (the flowers of a Yellow Box tree) and exotic habitat (nesting in the willows and in a European shrub, and taking insects from an oak in an open area).

The Red Wattlebird and Grey Butcherbird use the dead trees of the site as feeding vantage points. Leaf litter provided by the oaks are used as feeding grounds for the introduced Blackbird. Open areas are utilised by Magpie-larks and Eastern Rosellas.

The tall line of European trees in the southwest of the park potentially provide a roosting site for the Australian Hobby, although none was observed during the survey period.

A family of nine Pacific Black Ducks was observed moving back and forth along the creek, avoiding any humans who approached. The creek may also provide habitat for the Shortfin Eel and aquatic invertebrates.

In addition to the Red Wattlebirds mentioned above, the flowers of eucalypts in the park provide nectar for insects and nectar-eating birds (e.g. Musk Lorikeets), and the insects, in turn, provide food for insect-eating birds. The Sweet Bursarias' flowers would provide nectar for adult butterflies in summer.

The mat-rush (*Lomandra*) plants and native grasses in the park could provide the necessary food for caterpillars of certain native butterflies and moths, if they are present in the park; However, such usage was not investigated.

Nest boxes have been attached to some trees. The Friends of South Surrey Park have maintained the boxes and evicted feral bees when necessary. The use of these boxes by native wildlife was not determined.

Site significance ratings

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to part of this site. Note that revegetation represents an important proportion of the riparian vegetation.

BioSites criterion 1.2.6 attributes **Local** significance to links of local-scale ecological corridors, which applies to this site.

Regionally threatened Ecological Vegetation Class

Both of South Surrey Park's EVCs are threatened, but they are represented by such heavily modified vegetation that the BioSites criteria for threatened EVCs are not met.

Rare or threatened plants

South Surrey Park has viable, wild populations of the following plant species that are threatened in Boroondara: *Glyceria australis*, *Senecio minimus*, *Isolepis cernua* var. *platycarpa*, *Isolepis hookeriana*, *Isolepis inundata* and possibly *Eucalyptus melliodora*. Such species give the site **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

Most of the significant fauna listed above do not have viable populations that are supported wholly or largely by South Surrey Park. However, the group of White-browed Scrubwrens is quite likely to be resident, the reserve apparently capable of satisfying a large part of their habitat needs. Any locally threatened species that has a viable population gives the site **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
<p>Environmental weeds. The species of concern are:</p> <ul style="list-style-type: none"> • Serious: Drain Flat-sedge (<i>Cyperus eragrostis</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Cleavers (<i>Galium aparine</i>), Large-leafed Privet (<i>Ligustrum lucidum</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), English Oak (<i>Quercus robur</i>), Creeping Buttercup (<i>Ranunculus repens</i>), Clustered Dock (<i>Rumex conglomeratus</i>), Weeping Willow (<i>Salix babylonica</i> s.l.), Crack Willow (<i>Salix fragilis</i>), Wandering Jew (<i>Tradescantia fluminensis</i>); • Moderately serious: Lilly Pilly (<i>Acmena ?smithii</i>), Brown-top Bent (<i>Agrostis capillaris</i>), Aster-weed (<i>Aster subulatus</i>), Water Starwort (<i>Callitriche stagnalis</i>), Common Centaury (<i>Centaureum erythraea</i>), Spear Thistle (<i>Cirsium vulgare</i>), Hemlock (<i>Conium maculatum</i>), Mirror-bush (<i>Coprosma repens</i>), Hawthorn (<i>Crataegus monogyna</i>), Tiny Flat-sedge (<i>Cyperus tenellus</i>), Cape Ivy (<i>Delairea odorata</i>), Common Barnyard Grass (<i>Echinochloa crus-galli</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Glandular Willow-herb (<i>Epilobium ciliatum</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Ivy (<i>Hedera helix</i>), Yorkshire Fog (<i>Holcus lanatus</i>), Cat's Ear (<i>Hypochoeris radicata</i>), Hairy Hawkbit (<i>Leontodon taraxacoides</i>), Perennial Rye-grass (<i>Lolium perenne</i>), Japanese Honeysuckle (<i>Lonicera japonica</i>), Forget-me-not (<i>Myosotis</i> sp.), Watercress (<i>Nasturtium officinale</i>), Ribwort (<i>Plantago lanceolata</i>), Greater Plantain (<i>Plantago major</i>), Four-leafed Allseed (<i>Polycarpon tetraphyllum</i>), Self-heal (<i>Prunella vulgaris</i>), Cherry-plum (<i>Prunus cerasifera</i>), Curled Dock (<i>Rumex crispus</i>), Common Pearlwort (<i>Sagina apetala</i>), Pussy Willow (<i>Salix ×reichardtii</i>), Madeira Winter-cherry (<i>Solanum pseudocapsicum</i>), White Clover (<i>Trifolium repens</i>), Common Elm (<i>Ulmus</i> aff. <i>procera</i>), Tiny Vetch (<i>Vicia hirsuta</i>), Squirrel-tail Fescue (<i>Vulpia bromoides</i>), Rat's-tail Fescue (<i>Vulpia myuros</i>), White Arum Lily (<i>Zantedeschia aethiopica</i>). 	All	Moderate	Current
Smothering of two veteran <i>Bursaria spinosa</i> trees by exotic deciduous trees.	Exceptionally large plants	Moderate	Current
Over-vigorous growth of the indigenous plant species, <i>Clematis microphylla</i> , which has become a significant weed at nearby Welfare Pde, Camberwell. This species has been planted at both sites.	All	Low to Moderate	Potential
Precariously small populations of some remnant plant species (<i>Eucalyptus radiata</i> , <i>Pteridium esculentum</i> , <i>Solenogyne gunnii</i> and <i>Triglochin striatum</i>), causing vulnerability to inbreeding or chance events.	Significant flora	Moderate	Current
Damage to young plants in the revegetation areas (including extensive uprooting) by park users and neighbours, which has occurred in the past.	Revegetation	Moderate	Past and Potential
Disturbance of wildlife by humans and dogs, which reduces the variety and numbers of native birds, reptiles and frogs.	Birds, reptiles and frogs	Low to Moderate	Current
Overpopulation of the aggressive Red Wattlebird, displacing other species and possibly contributing to eucalypt dieback and general ecological imbalance.	Birdlife; Tree health	Moderate	Current
Eucalypt dieback disease due to psyllids, leaf skeletonisers, leaf miners or galls.	Eucalypts & dependent fauna	Low to moderate	Potential
Borer attack of wattles.	As above	Low to moderate	Potential

Priority actions

1. Lop the deciduous trees that are presently smothering two large Sweet Bursaria (*Bursaria spinosa*) plants, to the extent that this is consistent with visual amenity. The locations are marked on the aerial photograph on page 262. The bursaria near the playground is being smothered by an oak and the bursaria at the narrow neck in the site's northern polygon is being smothered by willows and cherry-plums. The cherry-plums should be removed altogether. The priority of this action is moderate in the context of the whole municipality and the urgency is moderate.
2. Establish a program to propagate more of the plant species mentioned in the 'Threats' table above as having precariously small populations, other than *Pteridium esculentum* (which is very hard to propagate). To avoid inbreeding, propagating material should be sought from other sites nearby, perhaps involving exchange between South Surrey Park and another site. South Surrey Park has the only known plant of *Triglochin striatum* in Boroondara, so propagating material should be sought further east, such as at Wattle Park (making sure to get the flat leafed variant).

Past management and revegetation

South Surrey Park was evidently once landscaped after the fashion of informal European parkland. Very little indigenous vegetation survived.

By the 1990s, many of the original exotic plantings had proliferated and run rampant along the creek, degrading the landscape, ecology and drainage function of the park. This occurred despite a Master Plan for the park formulated in 1987, which was not fully implemented. The Friends of South Surrey Park group formed and was successful in obtaining funding to revegetate the park and repair the landscape, leading (in part) to the preparation of the 1997 Master Plan.

The 1997 Master Plan has been guiding subsequent revegetation work in the park. Melbourne Water has recently conducted major creek reconstruction and woody weed control, which has been followed with revegetation.

Revegetation in the park is generally organised jointly between the Friends Group and the City of Boroondara. Unusually large numbers of indigenous plant species have been used. The intention has been to use purely indigenous species, but there have been some inadvertent deviations. Plantings lists are included in a report by Kern *et al.* (2000) whose details are given beneath the heading 'Information sources used in this assessment' below.

The revegetation plots are well maintained.

Future revegetation

Future revegetation should continue as in recent years, except that this report should help with selection of species that are ecologically appropriate for the site. Appendix C (page 464) provides lists of species suitable for planting within the park's two Ecological Vegetation Classes. Revegetation should only occur at a rate that leaves enough resources available to maintain existing revegetation, as has been the case so far.

Monitoring

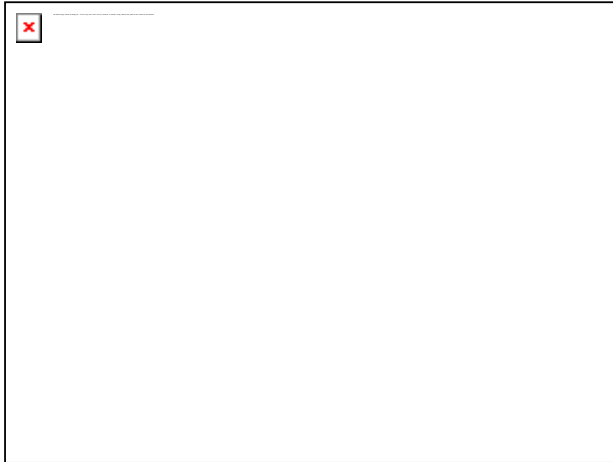
Data from a quadrat in a revegetation bed in South Surrey Park was provided in the report by Kern *et al.* (2000 – see 'Information sources' below). In theory, the quadrat data would be useful for monitoring the survival and growth of revegetation plants, but the mapped location and description of the quadrat do not accord with what is currently in the park.

The following items have been gathered to provide a baseline for future monitoring:

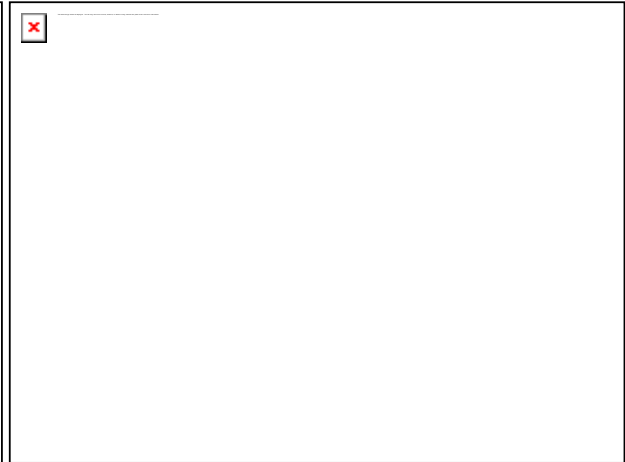
- Plant lists for each of the site's two Ecological Vegetation Classes (EVCs), as presented beneath the heading 'Full flora list' above. Repeat every four years or so. Check for loss or decline of indigenous species and changes in the seriousness of each weed species;
- Ratings of weed severity, separately for each EVC, stored in this study's database. Check in conjunction with the previous item;
- Population sizes of significant plant species that are dangerously scarce, as indicated in the section headed 'Flora of special significance'. These species' locations are mapped on the aerial photograph on page 262. Check the populations every two to four years, noting that shorter-lived species are likely to disappear from existing locations and appear elsewhere;
- Bird survey, including a twenty-minute bird census. Repeat in spring every two to four years. Check for changes in the abundance of birds (particularly aggressive honeyeaters), the particular species present and the species that are breeding;
- The monitoring photographs displayed below, with locations and orientations shown on the aerial photograph on page 262. Original digital images are available separately. Repeat the photographs about every two years, checking for weed growth and the features mentioned in the captions.

Monitoring photographs for South Surrey Park.

The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 262.



Site 27, Photo 1. This photo and Photo 2 are taken from a path junction near Union Rd on 16/12/04, to show the condition of revegetation. Note the thriving indigenous plants and paucity of weeds.



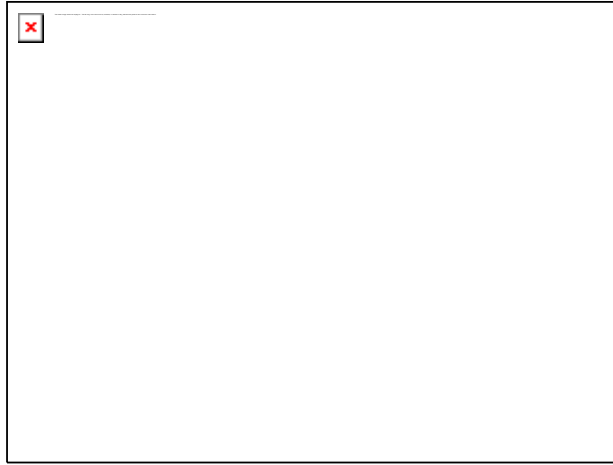
Site 27, Photo 2. As for Photo 1. The embankment at right in the distance is beside Union Rd.



Site 27, Photo 3. Looking downstream, where a drain discharges into the creek from the north, on 16/12/04. This scene is likely to change greatly in the next few years, to either a weedy scene or one of dense indigenous vegetation, and this photograph is to help determine the changes.



Site 27, Photo 4. A westward view with young vegetation along the creek visible in the distance. This photograph was taken on 16/12/04 for monitoring the rate of growth of the revegetation and changes in its density and structure.



Site 27, Photo 5. The large Yellow Box at the corner of Lille St and Verdun St, to show the tree's condition on 27/9/05. The trunk diameter is 78cm and the tree's health is good, marked down for minor trunk damage and mild psyllid damage (as at January 2006).

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of approximately 5½ hours on 10th and 16th December 2004, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of introduced and indigenous plant species (natural and planted) in each of the site's two EVCs, including the indigenous species' abundances and the threat level of all weed species in each area;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Ground truthing of this report on the site, conducted by Dr Lorimer on 19th January 2006 for approximately 40 minutes;
- A daytime bird survey of the site by David Lockwood on 6/10/04 according to the protocol discussed in Section 2.4.1, including a twenty-minute bird census;
- The 'South Surrey Park Master Plan', prepared by EDAW (Aust.) Pty Ltd for the City of Boroondara, dated December 1997;
- A report: 'Nichollsdaile [sic.] Road Drain South Surrey Park Vegetation Assessment' by Earth Tech Engineering Pty Ltd, dated 22/7/03. Note that this report gives a false impression of the extent of remnant vegetation in the park;
- A report by Kern L., Gannon P. and Muir A. (2000) titled 'Flora and Vegetation Mapping on Waterways in the City of Boroondara, Victoria: Back Creek', for the City of Boroondara. Note that the report draws no distinction between planted and natural indigenous plants, and there are omissions from the plant list;
- Aerial photography from August 2004;
- Information from the Department of Sustainability & Environment's fauna database;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

There is a patch of small grass plants near the *Eucalyptus radiata* that may be the locally rare *Austroanthonia geniculata*, but frequent mowing has so far prevented identification. The author has arranged for Mr Philip Crohn of the Friends of South Surrey Park to check in summer for flowering stems, should they be produced, to allow identification.

Acknowledgment

Thanks to Philip Crohn of the Friends of South Surrey Park, who provided documentation, a site tour and a verbal description of the park's recent history.

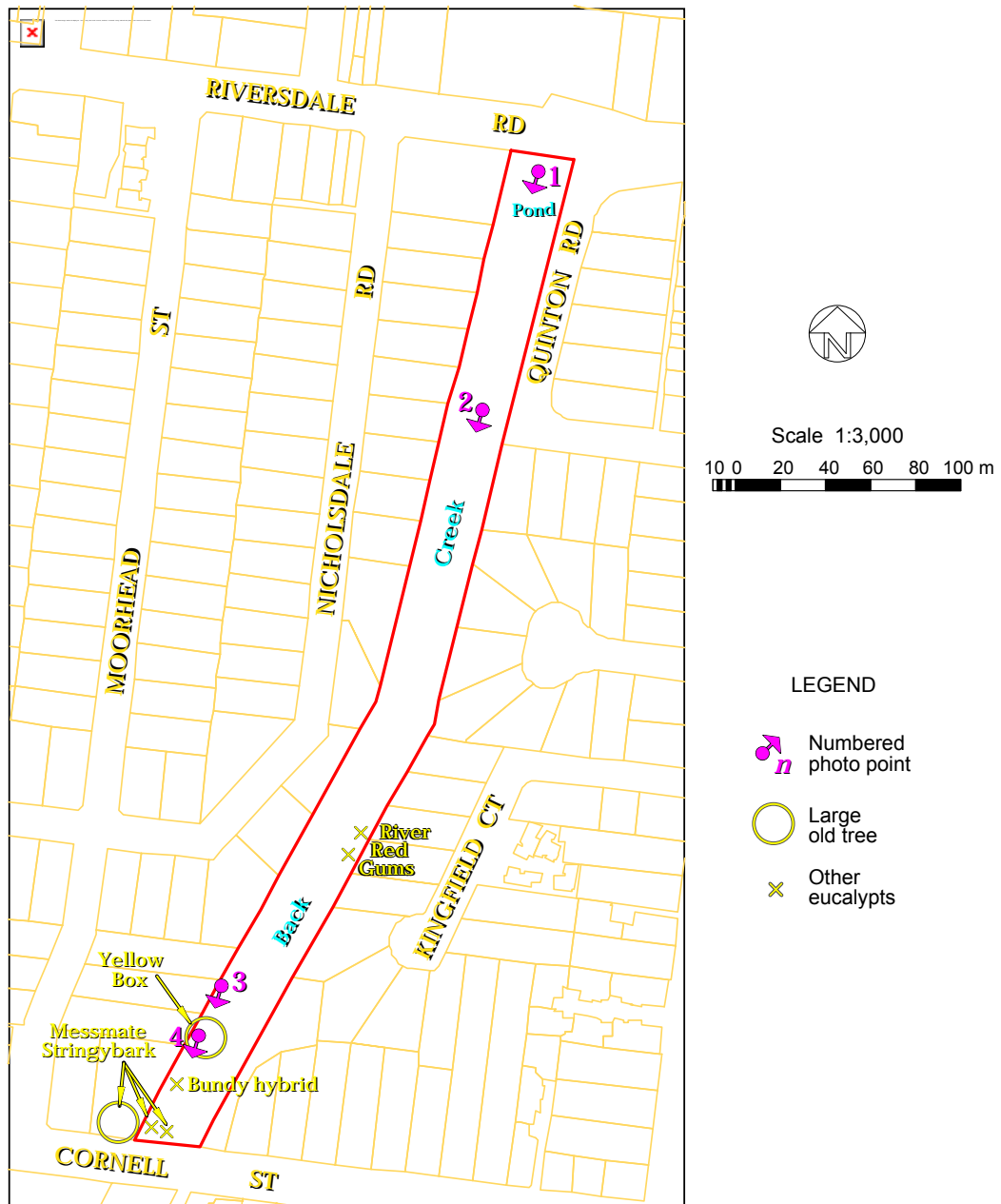
Site 28. Back Creek – Riversdale Rd to Cornell St

A section of Back Creek and its riverbank, with revegetation and scant remnant vegetation. Melway ref. 60 G2.

Site Biological Significance Level: *Local*

Summary of the most significant natural assets:

- Apparently viable populations of two plant species and at least three bird species that are threatened in Boroondara;
- There appears to be a functional wildlife corridor along Back Creek.



Boundaries

This site contains all of the drainage reserve outlined in red on the aerial photograph above, being a single property.

Land use & tenure

City of Boroondara reserve, for drainage, amenity, pedestrian use and conservation. Melbourne Water manages the creek.

Physical features

Site area: 1.3 hectares.

Elevation: A maximum of 65 m (at the top of the Riversdale Rd embankment) to 52 m (where the creek flows under Cornell St).

Landform: Minor creek and riverbanks, excavated to varying degrees. The height from the creek's normal water level to the top of the embankment is typically three metres.

Slope: The embankments of the creek channel are very steep (1:1 in places) and extend almost to the western and eastern edges of the site, leaving narrow flanks with slight gradients. The gradient along Back Creek averages approximately 1:75.

Soil type: There is shallow alluvium in the broader sections of the creek channel where water flow decelerates. Elsewhere, the soil was observed to be orange, sandy clay topsoil with clay subsoil, but excavation seems to have altered the soil composition, depth or structure in much of the site.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek Formation, exposed in the creek bed as whitish siltstone.

Site description

Back Creek is only a minor creek within this site, and Melbourne Water refers to it as the Nicholtsdale Rd Drain. Its banks appear to have been subject to fairly extensive earthwork and nearly all the original native vegetation has been cleared. Only six remnant eucalypts remain, but four of them are notable:

- One is a Yellow Box (*Eucalyptus melliodora*) that qualifies as a 'large old tree' by the criteria of the Department of Sustainability & Environment;
- One is apparently a hybrid, probably involving Bundy (*Eucalyptus goniocalyx*), which is represented by only one other tree in the whole municipality (Site 57); and
- Two are Messmate Stringybarks (*Eucalyptus obliqua*), and the only other representative of the species in Boroondara is a large old tree in the adjacent property, 29 Cornell St, Camberwell.

If not for the large old Messmate Stringybark adjacent to the reserve, one might question whether this species occurs naturally in Boroondara at all.

The tree canopy is dominated by dense exotics, particularly weedy deciduous trees such as willows and Box Elder. However, this has been changing rapidly with the removal of these trees by Melbourne Water and the City of Boroondara, to restore the stream's ecology and drainage function. Some of the exotic trees are being used by native birds for nest sites, including the Tawny Frogmouth. Spotted Pardalotes were observed nesting in a burrow at the base of an exotic tree, and there are reports of two other pairs nesting in or adjacent to the site in spring 2005.

A high diversity of bird species is a highlight of this site. This diversity must be dependent on trees and shrubs outside the site (e.g. Wattle Park and neighbouring gardens with Australian plants), as well as the mixture of exotic and indigenous vegetation within the site.

While few of the site's original canopy trees have persisted, there are even fewer remnants of the original understorey trees and shrubs, being represented only by two Black Wattles (*Acacia mearnsii*) in fair health.

Creeks are naturally dynamic environments. They have a continual influx of plant propagules from upstream, and are subject to periodic floods that destroy fringing vegetation. The indigenous plant species that occur naturally at the edges of creeks have evolved to strongly recolonise disturbed banks, and several species have done so in the present site – including some that are threatened in Boroondara.

The City of Boroondara and the Friends of Back Creek have been very active recently in revegetating the site with indigenous species, from wildflowers and grasses to canopy trees. The revegetation is mostly in a narrow band along the western edge of the site. There are also small areas of revegetation on the east bank of the creek near Quinton Rd and Cornell St, and amphibious species planted beside the creek and the pond near Riversdale Rd. The revegetation is young, and some of it will probably struggle to cope with competition from the established exotic trees and planted Australian native trees.

Ecological links with other land

This site is rather disconnected from other areas of natural habitat. This represents a risk to the viability of the indigenous flora and fauna, because there is insufficient habitat for most fauna and non-amphibious plant species to persist indefinitely in isolation from other habitat or members of their species. Management of the site's indigenous vegetation should recognise and counter the risk of plant inbreeding.

The next section of Back Creek downstream (south) of Cornell St has been replaced with an underground pipe, retaining practically no native vegetation. It therefore appears superficially unlikely that Back Creek could function as a wildlife corridor, except perhaps for Shortfin Eel. However, there is evidence of a wildlife corridor for some migratory or nomadic species. The Brown Goshawk is observed regularly, the Pink Robin has been observed for three consecutive years, and both the Rufous Fantail and Horsfield's Bronze-cuckoo were observed in March 2005 before migrating north for the winter. It seems most likely that these birds travel to this neighbourhood via Back Creek, given the very poor habitat on any other approach. This impression is strengthened by David Lockwood's observation of a single individual of the nomadic Yellow-faced Honeyeater moving upstream along the creek in South Surrey Park, just north of Riversdale Rd.

The Grey Fantail observed in this site and South Surrey Park during this study would also have to travel outside the area to satisfy its full habitat needs, and the fragmented corridor along Back Creek seems the most likely route for doing so.

Many birds, such as the Brown Goshawk and Grey Fantail, are likely to move along Back Creek across Riversdale Rd.

Wattle Park, 600 m to the east, is the nearest substantial area of native habitat with understorey. Without Wattle Park, there would probably be less diversity of birds and flying insects along Back Creek.

Habitat types

Perennial Stream (No EVC number).

The waterway may provide habitat for hardy fish such as the Shortfin Eel, and other aquatic fauna. There is one emergent aquatic plant: *Typha domingensis*. No submerged indigenous plants were detected.

Valley Grassy Forest (EVC 47, **vulnerable** in the Gippsland Plain bioregion)

This EVC is represented by a small number of scattered trees (five species) and a few indigenous annual herbs belonging to two species.

Canopy trees: Indigenous species are represented by two *Eucalyptus obliqua*, two *Eucalyptus camaldulensis*, one *Eucalyptus melliodora* and one apparent hybrid eucalypt involving *Eucalyptus goniocalyx*. All of these are mapped on the aerial photograph, along with a very large old *Eucalyptus obliqua* just east of the site, in the front garden of 29 Cornell St.

Lower trees: Reduced to two *Acacia mearnsii* growing next to the *Eucalyptus camaldulensis*.

Shrubs, vines, ferns: No indigenous species remain.

Ground flora: The indigenous species are reduced to scattered individuals of the widespread and weedy species, *Epilobium hirtigerum* and *Lythrum hyssopifolia*.

Creepline Herb-rich Woodland (EVC 164, **endangered** in the Gippsland Plain bioregion)

This EVC is represented by only seven hardy amphibious herb species with their roots normally saturated.

Ground flora: Indigenous species are mostly very sparse, but there are quite large numbers of *Isolepis inundata* and *Persicaria decipiens*. There are moderate numbers of *Isolepis cernua* var. *platycarpa* and *Persicaria lapathifolia*, very few *Juncus amabilis*, and one *Typha domingensis*.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Notes
Critically Endangered	<i>Eucalyptus obliqua</i>	Two individuals in good health. (Another grows nearby.)
Vulnerable	<i>Isolepis cernua</i> var. <i>platycarpa</i>	Reasonable numbers.
Vulnerable	<i>Isolepis inundata</i>	Numerous.
Vulnerable	<i>Typha domingensis</i>	One patch.
Vulnerable	<i>Eucalyptus melliodora</i>	One individual in good health.
Critically Endangered?	<i>Eucalyptus ?goniocalyx</i> hybrid	One individual in fair health.

Full flora list

The species found in the site on 10/12/04 and 31/3/05 are listed below, excluding planted species. The column headed 'Wet' is for species whose root systems are saturated by the creek most of the time, and a column headed 'Dry' is for the rest of the site. These columns correspond approximately to areas that were once Creepline Herb-rich Woodland and Valley Grassy Forest, respectively. In the grid squares, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found.

Species Name	Wet	Dry	Species Name	Wet	Dry	Species Name	Wet	Dry
Wild indigenous species			Weed species			<i>Hedychium gardnerianum</i>		✓
<i>Acacia mearnsii</i>		-	<i>Acer negundo</i>		✓	<i>Holcus lanatus</i>		✓
<i>Epilobium hirtigerum</i>		-	<i>Allium triquetrum</i>		✓	<i>Juncus tenuis</i>	-	
<i>Eucalyptus camaldulensis</i>		-	<i>Arundo donax</i>		✓	<i>Ligustrum lucidum</i>		-
<i>Eucalyptus ?goniocalyx</i> hybrid		-	<i>Aster subulatus</i>		✓	<i>Nasturtium officinale</i>	-	
<i>Eucalyptus melliodora</i>		-	<i>Atriplex prostrata</i>		-	<i>Persicaria maculosa</i>		-
<i>Eucalyptus obliqua</i>		-	<i>Callitriche stagnalis</i>	✓		<i>Plantago lanceolata</i>		✓
<i>Isolepis cernua</i> var. <i>platycarpa</i>	✓		<i>Calystegia silvatica</i>		✓	<i>Plantago major</i>		✓
<i>Isolepis inundata</i>	M		<i>Cirsium vulgare</i>		-	<i>Polycarpon tetraphyllum</i>		✓
<i>Juncus amabilis</i>	-		<i>Conyza sumatrensis</i>		✓	<i>Prunus cerasifera</i>		-
<i>Lunularia cruciata</i>	✓		<i>Coprosma repens</i>		-	<i>Ranunculus repens</i>	✓	
<i>Lythrum hyssopifolia</i>		-	<i>Cotoneaster glaucophyllus</i>		-	<i>Rubus anglocandicans</i>		-
<i>Persicaria decipiens</i>	M		<i>Crocsmia ×crocsmiiflora</i>		✓	<i>Salix ?fragilis</i>	✓	M
<i>Persicaria lapathifolia</i>	✓		<i>Cyperus eragrostis</i>	M		<i>Solanum mauritianum</i>		✓
<i>Typha domingensis</i>	-		<i>Delairea odorata</i>		✓	<i>Solanum nigrum</i>		M
			<i>Ehrharta erecta</i>		✓	<i>Solanum pseudocapsicum</i>		-
			<i>Fraxinus angustifolia</i>	-	✓	<i>Sonchus oleraceus</i>		-
			<i>Galium aparine</i>		M	<i>Tradescantia fluminensis</i>		D
			<i>Hedera helix</i>		✓	<i>Zantedeschia aethiopica</i>	-	✓

Large old trees

A trifurcated Yellow Box (*Eucalyptus melliodora*) mapped on the aerial photograph on page 272, has a trunk diameter of approximately 1.03 m, which exceeds the threshold of 0.7 m to qualify as a large old tree according to the Department of Sustainability & Environment's criterion. The Yellow Box's health was rated as good.

Just outside the site, at 29 Cornell St near to the footpath, there is a Messmate Stringybark (*Eucalyptus obliqua*) that also appears to be large enough to qualify as a large old tree. It is in good health. Its presence adds confidence to the conclusion that this species is indigenous to the area.

Fauna of special significance

The significant fauna species in the list below were observed by the author or Mrs Eleanor Stephenson, with dates as shown. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18). An obelisk (†) preceding the name of a species indicates that breeding was confirmed.

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
Near Threatened	Secure	Endangered	Nankeen Night Heron	2004
	Vulnerable	Vulnerable	Crested Pigeon	2004
		Occasional Visitor	Collared Sparrowhawk	2004
		Occasional Visitor	Pink Robin	2003
		Endangered	Crimson Rosella	2004
		Endangered	†Spotted Pardalote	2005
		Vulnerable	White-faced Heron	2004
		Vulnerable	Brown Goshawk	2003
		Vulnerable	Australian Hobby	2000
		Vulnerable	Yellow-tailed Black-Cockatoo	2004
		Vulnerable	Musk Lorikeet	2004
		Vulnerable	Eastern Rosella	2004
		Vulnerable	†Tawny Frogmouth	2005
		Vulnerable	Laughing Kookaburra	2004
		Vulnerable	White-browed Scrubwren	2004
		Vulnerable	†Eastern Spinebill	2005
		Vulnerable	Golden Whistler	2004
		Vulnerable	Grey Shrike-thrush	2001
		Vulnerable	Grey Fantail	2005
		Vulnerable	Black-faced Cuckoo-shrike	1999
		Occasional Visitor	Nankeen Kestrel	1999

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
		Occasional Visitor	Gang-gang Cockatoo	2004
		Occasional Visitor	Horsfield's Bronze-Cuckoo	2004
		Occasional Visitor	Striated Thornbill	1999

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies		Crested Pigeon	2004	White-plumed Honeyeater	2004
*Cabbage White	2005	Yellow-tailed Black-Cockatoo	2004	†Eastern Spinebill	2005
Common Brown	2005	Gang-gang Cockatoo	2004	Pink Robin	2003
Common Grass-blue	2005	Galah	2004	Golden Whistler	2004
Klug's Xenica	2005	Sulphur-crested Cockatoo	1999	Grey Shrike-thrush	2001
		Rainbow Lorikeet	2005	†Magpie-lark	2004
Birds		Musk Lorikeet	2004	Grey Fantail	2005
Australian Wood Duck	2004	Crimson Rosella	2004	Willie Wagtail	2004
†Pacific Black Duck	2004	Eastern Rosella	2004	Black-faced Cuckoo-shrike	1999
Chestnut Teal	2004	Horsfield's Bronze-Cuckoo	2004	Grey Butcherbird	2005
White-faced Heron	2004	†Tawny Frogmouth	2005	Australian Magpie	2005
Nankeen Night Heron	2004	Laughing Kookaburra	2004	Pied Currawong	2005
Brown Goshawk	2003	†Spotted Pardalote	2005	Little Raven	2004
Collared Sparrowhawk	2004	White-browed Scrubwren	2004	Silvereye	2004
Australian Hobby	2000	Brown Thornbill	2005	*Common Blackbird	2005
Nankeen Kestrel	1999	Striated Thornbill	1999	†*Song Thrush	2004
Silver Gull	1999	Red Wattlebird	2005	*Common Myna	2005
*Spotted Turtle-Dove	2005	Brush Wattlebird	2005		
		Noisy Miner	2005		

Site significance ratings

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.2.6 attributes **Local** significance to links of local-scale ecological corridors, which applies to this site.

Regionally threatened Ecological Vegetation Class

Both of the site's two EVCs are threatened, but they are represented by such heavily modified vegetation that the BioSites criteria for threatened EVCs are not met.

Rare or threatened plants

The site has viable, wild populations of *Isolepis cernua* var. *platycarpa* and *Isolepis inundata*, which are locally threatened. Such species give the site **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

Most of the significant fauna listed above do not have viable populations that are supported wholly or largely by habitat in the site. However, the Spotted Pardalote, Eastern Spinebill and Tawny Frogmouth are all breeding residents, evidently maintaining their presence over many years. Because there are apparently viable populations of these locally threatened species, the site has **Local** significance according to BioSites criterion 3.1.5. Note that these species are also reliant on neighbouring gardens, and perhaps also South Surrey Park (Site 27).

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
<p>Environmental weeds. The species of concern are:</p> <ul style="list-style-type: none"> • Serious: Drain Flat-sedge (<i>Cyperus eragrostis</i>), Cape Ivy (<i>Delairea odorata</i>), Cleavers (<i>Galium aparine</i>), Willow (<i>Salix ?fragilis</i>), Wandering Jew (<i>Tradescantia fluminensis</i>); • Moderately serious: Box Elder (<i>Acer negundo</i>), Angled Onion (<i>Allium triquetrum</i>), Giant Reed (<i>Arundo donax</i>), Water Starwort (<i>Callitriche stagnalis</i>), Greater Bindweed (<i>Calystegia silvatica</i>), Spear Thistle (<i>Cirsium vulgare</i>), Fleabane (<i>Conyza sumatrensis</i>), Mirror-bush (<i>Coprosma repens</i>), Cotoneaster (<i>Cotoneaster glaucophyllus</i>), Montbretia (<i>Crocasmia ×crocasmiflora</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Ivy (<i>Hedera helix</i>), Ginger Lily (<i>Hedychium gardnerianum</i>), Yorkshire Fog (<i>Holcus lanatus</i>), Large-leafed Privet (<i>Ligustrum lucidum</i>), Watercress (<i>Nasturtium officinale</i>), Ribwort (<i>Plantago lanceolata</i>), Greater Plantain (<i>Plantago major</i>), Four-leafed Allseed (<i>Polycarpon tetraphyllum</i>), Cherry-plum (<i>Prunus cerasifera</i>), Creeping Buttercup (<i>Ranunculus repens</i>), Blackberry (<i>Rubus anglocandicans</i>), Tobacco-bush (<i>Solanum mauritianum</i>), Black Nightshade (<i>Solanum nigrum</i>), Madeira Winter-cherry (<i>Solanum pseudocapsicum</i>), White Arum Lily (<i>Zantedeschia aethiopica</i>). 	All	Moderate	Current
Precariously small populations of <i>Acacia mearnsii</i> , <i>Eucalyptus camaldulensis</i> , <i>Eucalyptus melliodora</i> , <i>Eucalyptus obliqua</i> and the hybrid eucalypt, causing vulnerability to inbreeding or chance events.	Significant flora	Moderate	Current
Disturbance of wildlife by humans and dogs, which reduces the variety and numbers of native birds and frogs.	Birds, frogs	Low to Moderate	Current
Erosion or landslip of the creek embankment, particularly near stormwater outfalls from adjacent residences.	Water quality, native vegetation	Low to Moderate	Current
Borer attack of wattles.	As above	Low to moderate	Current
Eucalypt dieback disease due to psyllids, leaf skeletonisers, leaf miners or galls.	Indigenous trees; dependent fauna	Low to moderate	Potential

Priority actions

1. Arrange for an arborist to check the structural stability of the Yellow Box marked on the aerial photograph on page 272, if this has not already been done. The tree is trifurcated with some bark inclusion. The importance and urgency of this action are moderate in the context of the whole municipality. It may be wise to also ask the arborist to inspect the stability of the hybrid eucalypt located 25 m south of the Yellow Box, because of its lean. Neither tree should be removed; any instability should be corrected by lopping.
2. Plant several tubestock of *Eucalyptus melliodora* and *Eucalyptus obliqua*, propagated from parents as near as possible to this site (not within the site, to avoid inbreeding). South Surrey Park is the obvious source of seed for *Eucalyptus melliodora*. The importance and urgency of this action are moderate in the context of the whole municipality.
3. Collect seeds from the apparent hybrid eucalypt marked on the aerial photograph on page 272 and depicted in Photo 4 on page 279. The gumnuts may provide a clearer idea of the tree's identity (given that no gumnuts could be seen during the author's visits to the site). If the tree's identity still appears to be a hybrid involving a locally rare parent species, propagate the seed and see what species the offspring belong to. If *Eucalyptus goniocalyx* seedlings arise, a few of this species should be grown from seed collected nearby (not the tree on site) and planted within the drier parts of the Back Creek site. The importance and urgency of this action are low in the context of the whole municipality.

Past management and revegetation

See the section headed 'site description' on page 273.

Future revegetation

Future revegetation should continue as in recent years, except that this report should help with selection of species that are ecologically appropriate for the site. Appendix C (page 464) provides lists of species suitable for planting within the park's

two Ecological Vegetation Classes. Revegetation should only occur at a rate that leaves enough resources available to maintain existing revegetation, as has been the case so far.

The plantings mentioned in 'Priority actions' above should be incorporated into future revegetation plans.

Monitoring

The following items have been gathered to provide a baseline for future monitoring:

- Two plant lists, as presented beneath the heading 'Full flora list' above. Repeat every four years or so. Check for loss or decline of indigenous species and changes in the seriousness of each weed species;
- Ratings of weed severity, separately for the amphibious zone and the rest of the site, stored in this study's database. Check in conjunction with the previous item;
- Population sizes of wild indigenous plant species, as indicated in the sections headed 'Habitat types' and 'Flora of special significance'. The locations of less abundant species are mapped on the aerial photograph on page 272. Check the populations every two to four years;
- The full fauna list presented above. Check for changes in the abundance of birds, the particular species present and the species that are breeding, every two to four years. Mrs Eleanor Stephenson is presently monitoring bird movements;
- The monitoring photographs displayed on the next page, with locations and orientations shown on the aerial photograph on page 272. Original digital images are available separately. Repeat the photographs about every two years, checking for weed growth and the features mentioned in the captions.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of approximately 5½ hours on 10/12/04 and 31/3/05, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of wild introduced and indigenous plant species, including all species' abundances and the threat level of all weed species in each area;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- A tour of the site with local resident and bird observer, Mrs Eleanor Stephenson, who has been active within the Friends of Back Creek, restoring habitat to the site;
- Mrs Stephenson's personal bird observing diary, which goes back many years. Dr Lorimer discussed unusual observations with Mrs Stephenson to verify them;
- The Friends of Back Creek's website (presently at <http://www.users.bigpond.net.au/breen/fobc/>);
- A report by Kern L., Gannon P. and Muir A. (2000) titled '*Flora and Vegetation Mapping on Waterways in the City of Boroondara, Victoria: Back Creek*', for the City of Boroondara. Note that the report appears to have overlooked all of the naturally occurring indigenous plants between Cornell St and Riversdale Rd, and it lists only a fraction of the planted and weed flora. Also, the wrong vegetation types are mapped;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

The only further investigations recommended for this site are provided in the sections headed 'Priority actions' and 'Monitoring' above.

Acknowledgment

Thanks to Mrs Eleanor Stephenson of the Friends of Back Creek, who provided her bird observing diary and gave the author a site tour and a verbal description of the park's recent history.

Monitoring photographs, taken on 31st March 2005.

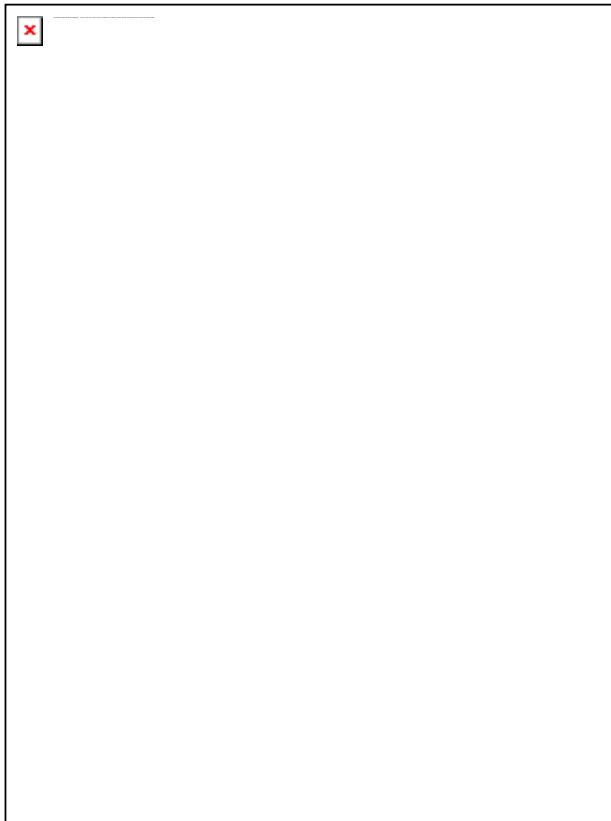
The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 272.



Site 28, **Photo 1**. The camera was positioned on the handrail of the path below the Riversdale Rd embankment. This photograph is to show the coverage of weeds and newly planted revegetation around the pond, and older plantings further from the creek. Note also the single plant of the locally vulnerable (but hardy) species, *Typha domingensis*, which may spread.



Site 28, **Photo 2**. A view of recent rockwork in the creek and adjacent young revegetation. The plants growing among the rocks are predominantly weeds but include *Persicaria decipiens* and *Isolepis inundata*. This scene is expected to change greatly within a few years.



Site 28, **Photo 3**. A southward view of the Yellow Box tree, partly obscured by a nearer Silky Oak. The main purpose is to show the foliage density in the Yellow Box's crown. The tree in Photo 4 can be seen in the distance.



Site 28, **Photo 4**. A southward view of the apparent hybrid eucalypt, to show its lean, foliage density and trunk damage from a vehicle or machine near ground level.

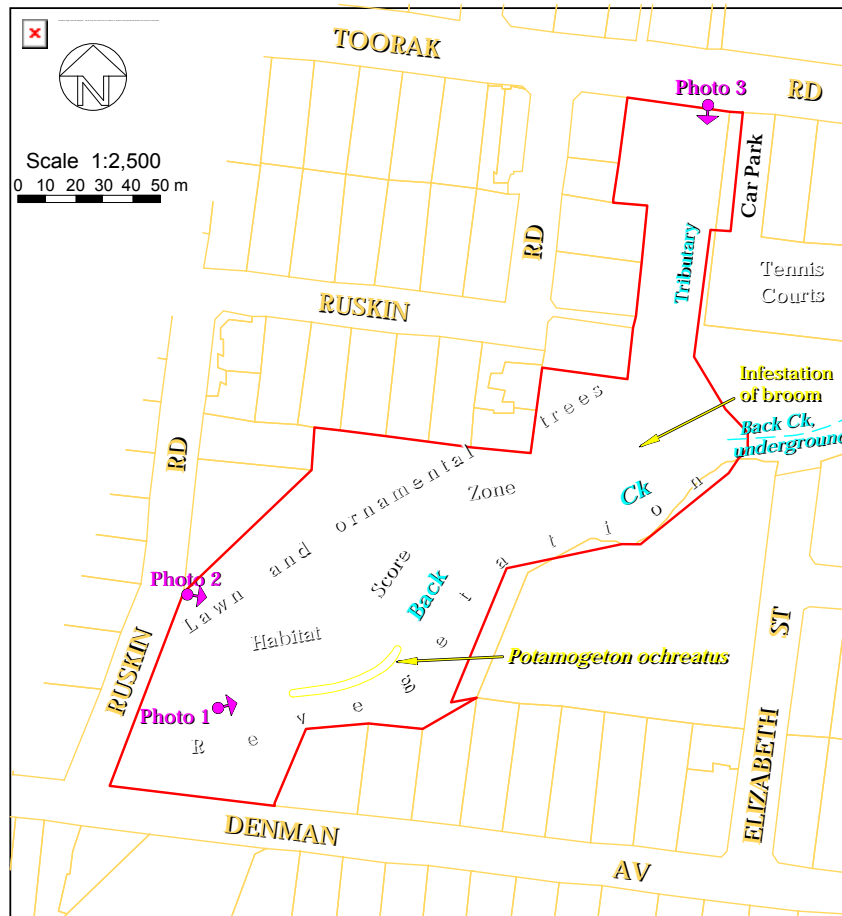
Site 29. Back Creek – Toorak Rd to Denman Av, Camberwell

A linear park along Back Creek, with extensive revegetation and scant remnant vegetation. Melway ref. 60 B6.

Site Biological Significance Level: *Local*

Summary of the most significant natural assets:

- Apparently viable populations of two plant species that are threatened in Boroondara, one of which (*Potamogeton ochreatus*) is the only known population within the whole municipality;
- Revegetation from 1999 is providing wildlife habitat and restoring the creek's ecology and drainage function;
- There is circumstantial evidence of a functional wildlife corridor along Back Creek.



Boundaries

This site is outlined in red on the aerial photograph above. Some of the eastern and southeastern segments of the boundary deviate from cadastral boundaries to follow the edge of the creek embankment and associated vegetation. The open area labelled 'lawn and ornamental trees' on the aerial photograph is of no particular biological significance but is included within the site for the sake of following cadastral boundaries wherever practical.

Land use & tenure

City of Boroondara reserve, for drainage, amenity, pedestrian use and conservation. Melbourne Water manages the creek.

Physical features

Site area: 1.8 hectares.

Elevation: A maximum of 31 m (at the top of the embankment beside Toorak Rd) and a minimum of 25 m (where the creek flows under Denman Av).

Landform: Creek and riverbanks (greatly altered by earthworks).

Slope: A vertical retaining wall, several metres tall, borders some of the creek. There are steep embankments of soil and rock at various other locations along the creek, and shallow slopes at the top of the banks. The gradient along Back Creek averages less than 1%.

Soil type: There is shallow alluvium in the creek channel. Elsewhere, the natural soil is believed to be a pale loam with clay subsoil, but excavation seems to have resulted in quite patchy soil composition, depth or structure.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek Formation, dominated by siltstone.

Site description

This site includes a section of Back Creek and a tributary that is named 'W' Creek in Melbourne Water documents. Back Creek enters the site via a pipe on the eastern edge, and the author found its water to be strongly coloured and odorous when he inspected it in December 2004, suggesting an industrial discharge as the cause. 'W' Creek enters the site from a culvert beneath Toorak Rd, north of which it flows above-ground for approximately 200 metres. Despite the high level of water pollution that was observed, Pacific Black Ducks and a family of Chestnut Teal (with ducklings) were in the creek, and it is possible that some fish also survive in the creek. Back Creek exits the site into a pipe that extends from Denman Avenue to Nettleton Park Reserve (Site 21), 1.2 km to the west-southwest.

The creek banks have been subject to massive earthworks, including retaining walls and rock lining. All the pre-settlement vegetation has been cleared, but some indigenous plants have re-established among the weeds and planted species.

Deciduous trees (particularly elms) had come to dominate the vegetation by 1999, when Melbourne Water cleared them to improve the stream's ecology and drainage function. Shortly following the clearing, extensive, dense revegetation of the banks was undertaken by Melbourne Water, the City of Boroondara and local residents. Some of this revegetation is marked as such on the aerial photograph, and most of the remainder is within the area labelled 'Habitat score zone'. Some plants appear to have been planted more sparsely along 'W' Creek.

Additional revegetation has occurred close to Toorak Rd, near the car park for the tennis courts. Some of the revegetated slope below the tennis court car park was observed slipping into the creek when inspected by the author in December 2004.

The site's attributes of biological significance relate to:

- The stream (including 'W' Creek), which supports ducks and some locally rare aquatic flora (and hence probably native stream fauna such as fish and invertebrates);
- Scattered plants on the banks that belong to locally threatened species; and
- The habitat represented by the revegetation, which was observed to support some sensitive bird species such as the Eastern Yellow Robin;

Ecological links with other land

This site is rather disconnected from other areas of natural habitat. This represents a risk to the viability of the indigenous flora and fauna, because there is insufficient habitat for most indigenous fauna and non-aquatic plant species to persist indefinitely in isolation from other habitat or members of their species. Management of the site's indigenous vegetation should recognise and counter the risk of plant inbreeding.

The next section of Back Creek downstream (south) of Denman Avenue has been converted to an underground pipe, with practically no native vegetation along the corridor. 'W' Creek upstream of Toorak Rd appears to have no native vegetation for 800 m, and it is mostly piped underground (like the upstream section of Back Creek). It therefore appears superficially unlikely that Back Creek or 'W' Creek could function as a wildlife corridor, except perhaps for hardy fish such as Shortfin Eel. However, there is evidence from further upstream, in Sites 27 and 28, that Back Creek does represent a wildlife corridor for some migratory or nomadic bird species (page 273).

The observations from those sites provide circumstantial evidence for a wildlife corridor between Surrey Hills and Glen Iris, and there is some support for this from the author's observations of Pacific Black Duck, Chestnut Teal and Eastern Yellow Robin between Toorak Rd and Denman St. It seems likely that some native birds move along Back Creek's fragmented habitat by using the tiny patches of native vegetation as ecological stepping-stones. The stepping-stones may include vegetation either side of the creek corridor.

The nearest site of native vegetation upstream is along the Alamein railway line (in Site 31, 400 m to the north and east), where both Back Creek and 'W' Creek are underground. The next area of native vegetation along Back Creek is north of Cornell St (Site 28), another 1.4 km upstream. The nearest site downstream is at Nettleton Park Reserve (Site 21, 1 km west-southwest).

Habitat types

Perennial Stream (No EVC number).

The waterway may provide habitat for hardy fish such as the Shortfin Eel, and other aquatic fauna. The creek supports emergent plants (*Typha* sp.) and submerged plants (2 m × 30 m of *Potamogeton ochreatus*, the only known occurrence of this species in Boroondara).

Plains Grassy Woodland (EVC 55, **endangered** in the Gippsland Plain bioregion).

There are only sparse vestiges of the Plains Grassy Woodland vegetation that once grew on the elevated parts of this site, above the zone of occasional inundation.

Canopy trees: No wild indigenous canopy trees remain.

Lower trees: There is one *Acacia melanoxylon* and one dead *Acacia mearnsii* next to the tennis courts, all apparently wild.

Shrubs, vines and ferns: There are no wild indigenous shrubs, vines or ferns in the whole site.

Ground flora: *Austrodanthonia racemosa* and *Epilobium billardierianum* subsp. *cinereum* are fairly abundant. The only other wild indigenous understorey plants found were small numbers of the weedy annual, *Juncus bufonius*.

Creepline Grassy Woodland (EVC 68, **endangered** in the Gippsland Plain bioregion).

This EVC is represented by amphibious plants at the water's edge and scattered plants that have regenerated on the banks since the clearing of elms in 1999.

Canopy trees: No wild indigenous canopy trees remain.

Lower trees: One large, dead *Acacia mearnsii* near Toorak Rd on the east bank of the creek.

Shrubs, vines and ferns: There are no wild indigenous shrubs, vines or ferns in the whole site.

Ground flora: There are many *Juncus amabilis* and *Persicaria decipiens* at the water's edge, as well as a patch of *Phragmites australis*. The damper, lower parts of the creek banks support moderate numbers of *Juncus bufonius*, *Juncus pallidus*, *Epilobium hirtigerum* and *Lythrum hyssopifolia*. The drier, upper slopes have moderate numbers of *Austrodanthonia racemosa*.

Habitat Score

Examples of the application of habitat scoring (p. 13) to revegetation do not appear to have been published previously, despite the importance that such scoring will have in coming years for monitoring achievement of the state and federal government's 'Net Gain' policies. To provide a fairly typical example for revegetation that is five years old, habitat scoring was conducted for the 2,100 m² of revegetation labelled 'Habitat score zone' on the aerial photograph on page 280. The benchmark chosen was for Creepline Grassy Woodland (EVC 68), which would have been the pre-settlement EVC.

The calculated habitat score was 10%, comprising five percentage points for understorey, four percentage points for organic litter and one percentage point for patch size. The score will probably soon rise by three percentage points as the planted eucalypts reach the threshold of 12 m tall to contribute to a score for tree canopy cover. Weed control could also increase the score by at least four percentage points without much effort.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Notes
Critically Endangered	<i>Potamogeton ochreatus</i>	The only population in Boroondara, spreading over 2 m × 30 m of the creek – see the aerial photo on page 280.
Vulnerable	<i>Juncus pallidus</i>	Moderate numbers along the creek.
Vulnerable	<i>Phragmites australis</i>	One patch.
Vulnerable	<i>Typha</i> sp.	One patch.

Full flora list

The species found in the site on 16/12/04 and 20/12/04 are listed below, excluding lawn and ornamental plantings. The columns headed 1 to 4 represent different parts of the site, as follows:

- 1 = Aquatic/amphibious;
- 2 = Other areas subject to flooding (except within 40 m of Toorak Rd), formerly Creepline Grassy Woodland;
- 3 = Areas not subject to flooding, formerly Plains Grassy Woodland;
- 4 = In a revegetation area, within 40 m of Toorak Rd (west of the tennis court car park).

In the grid squares:

- For indigenous species, 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found;
- For weed species, the numbers indicate the level of threat or impact: 's' indicates serious threat, 'm' indicates moderate threat and 'n' indicates no significant threat.

Species Name	- Area -				Species Name	- Area -				Species Name	- Area -			
	1	2	3	4		1	2	3	4		1	2	3	4
Wild indigenous species					Weed species									
<i>Acacia mearnsii</i> (2 dead)			-	-	<i>Acacia longifolia longifolia</i>			m		<i>Lepidium africanum</i>		m		
<i>Acacia melanoxylon</i> (×1)			-		<i>Acer negundo</i>		m			<i>Leucanthemum vulgare</i>		n		
<i>Austrodanthonia racemosa</i>	✓	✓			<i>Acmena ?smithii</i>		n			<i>Ligustrum lucidum</i>		s		
<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>			✓		<i>Agapanthus praecox</i>		n			<i>Lolium perenne</i>	n	m		
<i>Epilobium hirtigerum</i>		✓			<i>Agrostis capillaris</i>		m			<i>Modiola caroliniana</i>		m		
<i>Juncus amabilis</i>	M				<i>Anthoxanthum odoratum</i>		m			<i>Nassella trichotoma</i>		m		
<i>Juncus bufonius</i>	✓		-		<i>Aster subulatus</i>		m			<i>Paraserianthes lophantha</i>		m		
<i>Juncus pallidus</i>	-	✓			<i>Avena</i> sp.		m	m		<i>Parietaria judaica</i>		m		
<i>Lythrum hyssopifolia</i>		✓			<i>Brassica fruticulosa</i>			s	m	<i>Paspalum distichum</i>	m			
<i>Melaleuca stipoides</i>		-			<i>Bromus catharticus</i>		m	m		<i>Pennisetum alopecuroides</i>		m		
<i>Oxalis exilis/perennans</i>		-			<i>Bromus diandrus</i>		m	m		<i>Pennisetum clandestinum</i>		m		
<i>Persicaria decipiens</i>	M				<i>Centaurium erythraea</i>		n			<i>Phalaris aquatica</i>		m		
<i>Phragmites australis</i>		-			<i>Cirsium vulgare</i>			m	m	<i>Pittosporum undulatum</i>		m	m	
<i>Potamogeton ochreatus</i>	✓				<i>Conyza sumatrensis</i>		m			<i>Plantago coronopus</i>	n	m		
<i>Typha</i> sp.	-				<i>Coprosma repens</i>		m	m		<i>Plantago lanceolata</i>		m	m	
Planted indigenous species					<i>Cotoneaster glaucophyllus</i>			m		<i>Polycarpon tetraphyllum</i>		m	m	
<i>Acacia dealbata</i>			✓		<i>Cotoneaster pannosus</i>			m		<i>Prunella vulgaris</i>		n		
<i>Acacia implexa</i>			✓		<i>Cotula coronopifolia</i>	n				<i>Prunus cerasifera</i>		m	m	
<i>Acacia mearnsii</i>			✓	✓	<i>Cynodon dactylon</i>		m			<i>Pyracantha ?angustifolia</i>			m	
<i>Acacia melanoxylon</i>		✓	-		<i>Cynodon dactylon</i>		m			<i>Quercus robur</i>		m		
<i>Acacia pycnantha</i>				✓	<i>Cyperus eragrostis</i>	m				<i>Ranunculus repens</i>		m		
<i>Acacia verticillata</i>			✓		<i>Cytisus scoparius</i>		s			<i>Rubus ?anglocandicans</i>		m	m	
<i>Allocasuarina verticillata</i>			✓		<i>Dactylis glomerata</i>		m			<i>Rumex conglomeratus</i>		s		
<i>Bursaria spinosa</i>			✓		<i>Delairea odorata</i>		m	m		<i>Salix ?fragilis</i>	m			
<i>Callistemon sieberi</i>		✓			<i>Ehrharta erecta</i>		s	s	m	<i>Salix ×sepulcralis</i> var. <i>chrysocoma</i>	m			
<i>Eucalyptus camaldulensis</i>		✓	✓		<i>Erigeron karvinskianus</i>		m			<i>Salpichroa origanifolia</i>				m
<i>Eucalyptus melliodora</i>			✓		<i>Festuca arundinacea</i>		m			<i>Solanum mauritianum</i>		m		
<i>Goodenia ovata</i>			✓	✓	<i>Foeniculum vulgare</i>		m			<i>Solanum nigrum</i>		m	m	
<i>Hakea nodosa</i>			✓		<i>Fraxinus angustifolia</i>		m	m		<i>Solanum pseudocapsicum</i>		m		
<i>Kunzea ericoides</i> s.l.			✓	✓	<i>Galium aparine</i>				m	<i>Sonchus oleraceus</i>			n	n
<i>Leptospermum scoparium</i>		✓	✓		<i>Gamochaeta purpurea</i>		n			<i>Taraxacum</i> sp.		m		
<i>Lomandra longifolia</i>				✓	<i>Genista linifolia</i>		m			<i>Tradescantia fluminensis</i>	m	m		
<i>Melaleuca ericifolia</i>	✓	✓	✓		<i>Genista monspessulana</i>		m			<i>Trifolium dubium</i>		n		
<i>Meliclytus dentatus</i>		✓			<i>Geranium dissectum</i>		n			<i>Trifolium repens</i>		m		
<i>Poa labillardierei</i>		✓	✓		<i>Geranium molle</i>			n		<i>Tropaeolum majus</i>		m		
<i>Pomaderris racemosa</i>		✓	✓		<i>Hedera helix</i>		m			<i>Ulex europaeus</i>		m		
<i>Solanum laciniatum</i>				✓	<i>Helminthotheca echioides</i>		m			<i>Ulmus</i> sp.				m
<i>Viminaria juncea</i>			✓	✓	<i>Holcus lanatus</i>		m			<i>Vinca major</i>		m		
					<i>Hypochoeris radicata</i>		m							
					<i>Lactuca serriola</i>		n	n						
					<i>Leontodon taraxacoides</i>		m							

Fauna of special significance

The significant fauna species in the list below have been observed in the site. The meaning of the conservation status rating, 'vulnerable', is explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Last Record	Notes
Vulnerable	Musk Lorikeet	2004	A flock was seen feeding in revegetation, by the author.
Vulnerable	Laughing Kookaburra	2003	A neighbour reported occasional visits until the previous year.
Vulnerable	Eastern Yellow Robin	2004	The author saw one individual foraging by Back Creek.

Full fauna list

The following list was compiled from the author's observations over 3 hours and 35 minutes, plus a neighbour's report of Laughing Kookaburra. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies	Birds	Red Wattlebird	†Pied Currawong
*Cabbage White	†Pacific Black Duck	Brush Wattlebird	Little Raven
Common Brown	†Chestnut Teal	Noisy Miner	Welcome Swallow
Common Grass-blue	*Spotted Turtle-Dove	White-plumed Honeyeater	*Common Blackbird
	Rainbow Lorikeet	Eastern Yellow Robin	*Common Starling
Mammals	Musk Lorikeet	Magpie-lark	*Common Myna
Common Brushtail Possum	Laughing Kookaburra	Willie Wagtail	
*Red Fox	Brown Thornbill	†Australian Magpie	

Site significance ratings

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to part of this site. Note that revegetation represents most of the riparian vegetation.

BioSites criterion 1.2.6 attributes **Local** significance to links of local-scale ecological corridors, for which there is some evidence at this site.

Regionally threatened Ecological Vegetation Class

Both of the site's two original EVCs are now endangered, but they are represented by such heavily modified vegetation that the BioSites criteria for threatened EVCs are not met.

Rare or threatened plants

The site has viable, wild populations of *Potamogeton ochreatus* and *Juncus pallidus*, which are locally threatened. Such species give the site **Local** significance according to BioSites criterion 3.1.5.

Rare or threatened fauna

The significant fauna listed above do not have viable populations that are supported wholly or largely by habitat in the site, and therefore do not meet BioSites criteria for significance related to rare or threatened fauna. A more intensive fauna survey (particularly fish) may find other species that would meet the criteria.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Twiggy Turnip (<i>Brassica fruticulosa</i>), English Broom (<i>Cytisus scoparius</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Large-leafed Privet (<i>Ligustrum lucidum</i>), Clustered Dock (<i>Rumex conglomeratus</i>); • Moderately serious: Sallow Wattle (<i>Acacia longifolia</i> subsp. <i>longifolia</i>), Box Elder (<i>Acer negundo</i>), Brown-top Bent (<i>Agrostis capillaris</i>), Sweet Vernal-grass (<i>Anthoxanthum odoratum</i>), Aster-weed (<i>Aster subulatus</i>), Oat (<i>Avena</i> sp.), Prairie Grass (<i>Bromus catharticus</i>), Great Brome (<i>Bromus diandrus</i>), Spear Thistle (<i>Cirsium vulgare</i>), Fleabane (<i>Conyza sumatrensis</i>), Mirror-bush (<i>Coprosma repens</i>), Cotoneaster (<i>Cotoneaster glaucophyllus</i>), Cotoneaster (<i>Cotoneaster pannosus</i>), Couch (<i>Cynodon dactylon</i>), Drain Flat- 	All	Moderate	Current

Threat	Natural assets affected	Severity	When?
sedge (<i>Cyperus eragrostis</i>), Cocksfoot (<i>Dactylis glomerata</i>), Cape Ivy (<i>Delairea odorata</i>), Bony-tip Fleabane (<i>Erigeron karvinskianus</i>), Tall Fescue (<i>Festuca arundinacea</i>), Fennel (<i>Foeniculum vulgare</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Cleavers (<i>Galium aparine</i>), Flax-leafed Broom (<i>Genista linifolia</i>), Montpellier Broom (<i>Genista monspessulana</i>), Ivy (<i>Hedera helix</i>), Ox-tongue (<i>Helminthotheca echioides</i>), Yorkshire Fog (<i>Holcus lanatus</i>), Cat's Ear (<i>Hypochoeris radicata</i>), Hairy Hawkbit (<i>Leontodon taraxacoides</i>), Common Pepper-cress (<i>Lepidium africanum</i>), Perennial Rye-grass (<i>Lolium perenne</i>), Carolina Mallow (<i>Modiola caroliniana</i>), Serrated Tussock (<i>Nassella trichotoma</i>), Cape Wattle (<i>Paraserianthes lophantha</i> subsp. <i>lophantha</i>), Wall Pellitory (<i>Parietaria judaica</i>), Water Couch (<i>Paspalum distichum</i>), Swamp Foxtail-grass (<i>Pennisetum alopecuroides</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Toowoomba Canary-grass (<i>Phalaris aquatica</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Buck's-horn Plantain (<i>Plantago coronopus</i>), Ribwort (<i>Plantago lanceolata</i>), Four-leafed Allseed (<i>Polycarpon tetraphyllum</i>), Cherry-plum (<i>Prunus cerasifera</i>), Orange Firethorn (<i>Pyracantha ?angustifolia</i>), English Oak (<i>Quercus robur</i>), Creeping Buttercup (<i>Ranunculus repens</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Crack Willow (<i>Salix ?fragilis</i>), Golden Weeping Willow (<i>Salix ×sepulcralis</i> var. <i>chrysocoma</i>), Pampas Lily-of-the-Valley (<i>Salpichroa organifolia</i>), Tobacco-bush (<i>Solanum mauritianum</i>), Black Nightshade (<i>Solanum nigrum</i>), Madeira Winter-cherry (<i>Solanum pseudocapsicum</i>), Dandelion (<i>Taraxacum</i> sp.), Wandering Jew (<i>Tradescantia fluminensis</i>), White Clover (<i>Trifolium repens</i>), Nasturtium (<i>Tropaeolum majus</i>), Gorse (<i>Ulex europaeus</i>), Elm (<i>Ulmus</i> sp.), Blue Periwinkle (<i>Vinca major</i>).			
Erosion and landslip of the creek bank.	Revegetation ; remnant flora	Low to Moderate	Current
Disturbance of birds by humans and dogs, which reduces the variety and numbers of birds.	Birds	Low to Moderate	Current
Borer attack of wattles.	Revegetation ; bird habitat	Low to moderate	Current
Eucalypt dieback disease due to psyllids, leaf skeletonisers, leaf miners or galls.	Revegetation ; bird habitat	Low to moderate	Potential
Precariously small wild populations of <i>Acacia mearnsii</i> , <i>Acacia melanoxylon</i> , <i>Phragmites australis</i> and <i>Typha</i> .	Flora	Low	Current

Priority actions

1. Control the localised infestation of broom species (*Cytisus scoparius* plus one *Genista linifolia*) at the location marked on the aerial photograph on page 280. The urgency of this action is high and the importance is moderate in the context of the whole municipality.
2. Destroy the single, isolated plants of *Ulex europaeus* and *Nassella trichotoma* below the tennis courts car park. The urgency of this action is high and the importance is moderate in the context of the whole municipality.
3. (For Melbourne Water:) Stabilise the landslip occurring next to the tennis court car park. The urgency of this action is high and the importance is moderate in the context of the whole municipality.
4. (For the EPA:) Investigate the frequency of serious water pollution discharged into Back Creek, and if possible, determine its source and prevent it. The urgency and importance of this action are moderate in the context of the whole municipality.
5. Bring the grass weed, *Ehrharta erecta*, under reasonable control in the revegetation areas, using grass-specific herbicide.

Past management and revegetation

See the section headed 'site description' on page 281.

Future revegetation

The primary aim for revegetation in the short to medium term should be to control weeds in the existing revegetation and stabilise weed cover at a lower level. See also Priority Action 5 above.

Monitoring

The following items have been gathered to provide a baseline for future monitoring:

- Four plant lists, as presented beneath the heading 'Full flora list' above. Repeat every four years or so. Check for loss or decline of indigenous species and changes in the seriousness of each weed species;
- Population sizes of the indigenous plant species listed in the section headed 'Flora of special significance'. The location of the *Potamogeton ochreatus* is mapped on the aerial photograph on page 280. Check the populations every two to four years;
- The fauna list presented above. Check for changes in the abundance of birds, the particular species present and the species that are breeding, every two to four years;
- The monitoring photographs displayed on the next page, with locations and orientations shown on the aerial photograph on page 280. Original digital images are available separately. Repeat the photographs about every two years, checking for weed growth and the features mentioned in the captions.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of 3 hours and 35 minutes on 16th and 22nd December 2004, using this study's standard approach described in Section 2.3. This included:
 - Compilation of four lists of wild introduced and indigenous plant species, each list including a measure of the abundance of each indigenous species and the threat level of all weed species;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- A neighbour's report of observing Laughing Kookaburra in the site the previous year;
- A report by Kern L., Gannon P. and Muir A. (2000) titled '*Flora and Vegetation Mapping on Waterways in the City of Boroondara, Victoria: Back Creek*', for the City of Boroondara. However, neither the vegetation mapping nor the species listed are reliable;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

The only further investigations recommended for this site are provided in the sections headed 'Priority actions' and 'Monitoring' above.

Monitoring photographs, taken on 22nd December 2004.

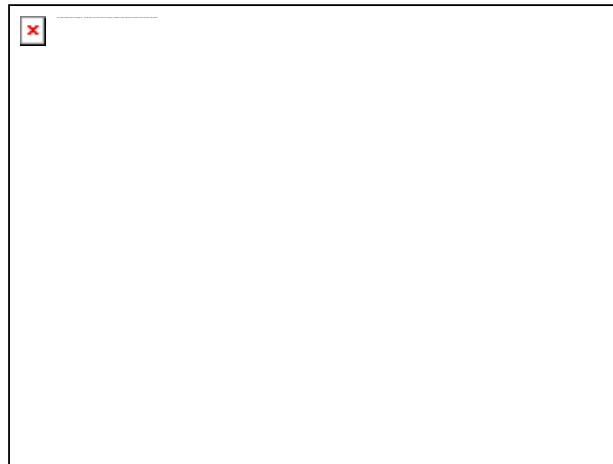
The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 280.



Site 29, Photo 1. The photographer is at the retaining wall that extends from Denman Avenue along the west side of the creek. The purpose is to show the coverage of weed species along the creek margin, the slope of silt on the northern edge of the creek (which provides important habitat) and the extent of *Potamogeton ochreatus* within the creek.



Site 29, Photo 2. An overview of revegetation that formed the habitat score zone for this study, to show the revegetation's density and stage of growth.



Site 29, Photo 3. A view over Back Creek's tributary, 'W' Creek, from the Toorak Rd bridge, to show the density of weeds around the pond and the condition of revegetation further up the banks. Note also the dead Black Wattles, one each side of the creek.

Site 30. Rail Reserve – Burwood Station to Alamein Station

A section of rail reserve with remnant vegetation. Melway ref. 60 D6 to D11.

Site Significance Level: *State* generally and *National* for a single Studley Park Gum

Summary of the most significant natural assets:

- Remnants of the endangered Ecological Vegetation Classes called Plains Grassy Woodland, Grassy Woodland and Creekline Grassy Woodland;
- Populations of numerous significant plant species, including a single, very rare Studley Park Gum (*Eucalyptus ×studleyensis*) and many species not recorded elsewhere in Boroondara (or the whole eastern suburbs, in one case).

Boundaries

This site contains the two stretches of rail reserve outlined in red on the aerial photograph. The northern end is the Burwood Station platform. The rest of the boundary coincides mostly with the rail reserve's cadastral boundaries, the exceptions being: (a) the kerb along Laurel St; (b) the kerb of Prosper Pde south from Summerhill hill Park; and (c) the edge of a shared pathway just south of High St.

The strip from Burwood Station to High St was divided into segments A to N by Cowdell (1990 – see 'Information sources' on p. 300). These segments are marked '§A' to '§N' on the aerial photograph, along with three new segments, O-Q, south of High St.

Land use & tenure

Rail reserve, including two stations. VicTrack manages most of the site, but the City of Boroondara manages the shared path and 1 m each side, plus the few narrow strips of road reserve within the site.

Physical features

Site area: 8.4 hectares.

Elevation: The low points are at each end of the site, with elevations of 42 m. The high point of 55 m is near High St.

Landform: Gently undulating terrain, crossing two low ridges with a drainage line between them.

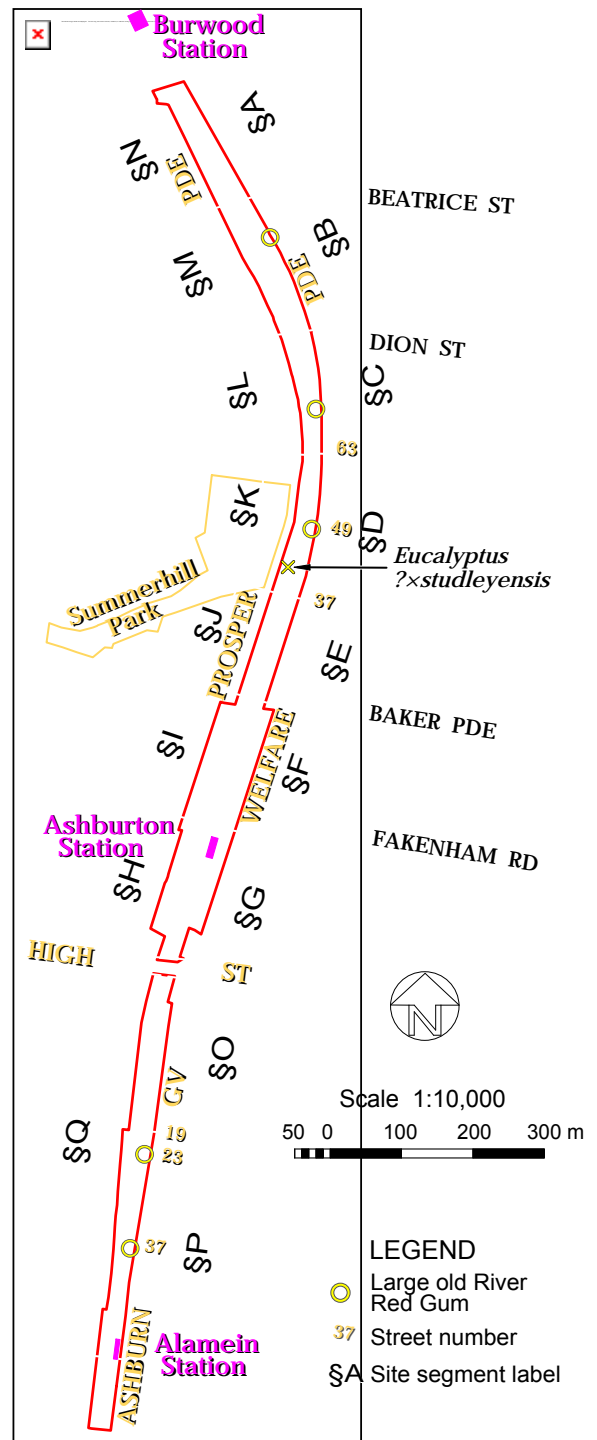
Slope: The rail cuttings and embankments are very steep, but otherwise the gradients are gentle.

Soil type: Shallow alluvium in the drainage line at Summerhill Park (Segments D and K); shallow, rather fine, pale sands on the ridges in Segments F and O; and pale loam with clay subsoil elsewhere.

Underlying geology: Segments F and O have a shallow layer (mostly less than one metre deep) of poorly consolidated Tertiary sands of the Red Bluff group. Elsewhere, the bedrock is Silurian sedimentary rock of the Andersons Creek Formation, dominated by siltstone.

Site description

This is one of the most biologically significant sites in Boroondara, because of the presence of threatened plant species and remnants of endangered Ecological Vegetation Classes. Segment B on the aerial photograph also puts on the best wildflower display in



Boroondara (with the possible exception of Yarra Bend Park, which was not investigated in detail in this study).

Note that the author may have missed some small plants close to the train tracks due to occupational health and safety constraints. The omissions may have included biologically significant plants.

As is usual for road and rail reserves, the most ecologically intact vegetation is on the highest ground, where there is least cause for drainage works and where gravity helps to resist the ingress of some weed seeds. All the site's native vegetation has at least a substantial level of modification from its natural state, but the ridge top in Segments A and B retain a fairly natural structure and good representation of characteristic plant species in all four strata. This is probably the best location to see what the pre-settlement vegetation looked like across about half of Boroondara. The ecological condition of the vegetation there is rated 'C - fair' on the scale described in Section 2.3.4, with habitat scores of 35-39%.

In all segments where the train tracks are within a cutting, the embankment has been colonised by indigenous trees, shrubs and ground flora, in various proportions with woody weeds such as cotoneasters and Sweet Pittosporum. A highlight of the site is that south of High St, the rail cuttings support a substantial number of plants of Coast Manna Gum (*Eucalyptus viminalis* ssp. *pryoriana*), which is otherwise represented in the municipality only by seven individuals in Yarra Bend Park*. The very shallow, skeletal soil, extensive exposed rock and rapid drainage on the cutting embankments are not good growing conditions, but indigenous plants are better able to thrive than to weeds. The regular trimming and lopping of trees and shrubs beside the tracks for safety might also appear to be harsh on plants, but some indigenous species, like the Coast Manna Gums, sprout back well.

Consistent with the observations of Cowdell (1990), the ecological condition of native vegetation in this site is consistently highest within about two metres each side of the brow of each cutting. This position is where the availability of moisture in the soil would be lowest and where damaging activities such as indiscriminate mowing and herbicide use are least likely.

Areas where the tracks are elevated above the natural terrain are generally weedier than the segments with cuttings. However, beside the most elevated section of track (in Segment K, opposite Summerhill Park) grows a eucalypt that appears to be a Studley Park Gum, *Eucalyptus ×studleyensis*. A pressed specimen from this tree has been lodged at the National Herbarium of Victoria, and the confidence in the identity is approximately 80% certain. If the identity is correct, this tree is of a kind that is listed as endangered in Victoria, and it is therefore the most threatened species (or hybrid) in the site.

Because this site is so conspicuous to passing traffic and contains so many significant plants, three previous reports have been written about it (Muir 1976, Frood 1989 and Cowdell 1999 – see 'Information sources' on page p. 300) and there is a reasonable basis to determine the rate of change of the native vegetation's ecological condition. The present author found many indigenous plant species that were not recorded in the earlier reports, but this simply reflects the relative thoroughness of the investigations. More importantly, a substantial number of plant species that were present until 1990 have evidently vanished. In some cases, the locations where these species occurred have been badly damaged by mowing and informal gardening by neighbours since 1990. Herbicide also appears to have been a major factor in the loss of species and the decline of ecological condition that has occurred in the past fifteen years.

Herbicides have been used within the site for three purposes: to suppress vegetation next to the tracks for train safety; to destroy existing plants so that gardens could be created; and spot-spraying to control environmental weeds in Segments A and B. The increasing use of herbicide for purposes related to train safety appears to be causing a shift from indigenous ground flora next to the tracks toward shorter-lived weeds. The creation of gardens has had more drastic consequences. The most serious case found by the author was in Sector O, just south of High St on the east of the tracks beside Ashburn Grove. In a misguided effort to create a more park-like appearance, herbicide and mulch were applied in 2004 over some of the most significant indigenous ground flora in Boroondara. Fortunately, the activity missed part of Boroondara's sole population of Forest Sun-orchid (*Thelymitra arenaria*), but even a small extension of the mulched area, or spraying along its edge, could render that species extinct from the municipality.

In the same area, dumping of weed-ridden garden waste by neighbours appears to be frequent, steadily destroying a significant proportion of the minute remaining fraction of Boroondara's original Grassy Woodland (which once covered nearly half the municipality). Dumping of garden waste is widespread along the rail reserve generally, and it (or the consequent weed infestations) are probably responsible for the disappearance of some locally threatened plant species from the site in the past fifteen years.

Because of the site's high biological significance and the pressures the vegetation is under, the City of Boroondara has in the past decade fenced most of Segments A and B – the most ecologically intact parts of the site. Council has undertaken planting and weed control above the cutting within the fenced area. Unexpectedly, one of the indigenous species planted, *Clematis microphylla*, has quickly become an environmental weed, proliferating greatly and smothering indigenous shrubs.

* Beardsell (2003) believed the rough-barked Manna Gums in Yarra Bend Park were subspecies *cygnetensis*, but eucalypt expert, M.I.H. Brooker, has determined the only pressed specimen at the National Herbarium of Victoria from the park to be subspecies *pryoriana*.

Ecological links with other land

This site can be thought of as a component of Site 31, the Outer Circle Railway corridor, and it is only separated in this report because it stands out for its populations of rare plants and the presence of more intact understorey. Collectively, Sites 30 and 31 provide a moderately continuous corridor of indigenous trees from Gardiners Creek to the Burwood Station. There is also a somewhat more fragmented corridor of indigenous trees along the Alamein train line to the north of Burwood Station, separated by a gap of approximately 300 metres across Toorak Rd.

One might expect the corridor of trees to function to some degree as a wildlife corridor for native birds and insects. However, no real evidence of corridor usage by native birds was found by either the author during his 23¾ hours at the site or David Lockwood when he investigated the site for this study on 1st October 2004. Evidence might be found during a longer investigation, but Lockwood and the author both found evidence of corridor usage with less effort at other, less promising sites.

It was not possible to draw even tentative conclusions about flying insects' usage of the site as a corridor.

Habitat types

Plains Grassy Woodland (EVC 55, **endangered** in the Gippsland Plain bioregion).

This EVC applies to all sections of the site except Segments D, K and O, and a small area bordering Segments E and F.

Canopy trees: *Eucalyptus camaldulensis* with a small number of *Eucalyptus melliodora*.

Lower trees: *Acacia mearnsii* and *Acacia melanoxylon* are rather abundant. *Acacia implexa* and *Exocarpos cupressiformis* are rare. The weed tree, *Pittosporum undulatum*, is abundant.

Shrubs: Patchy, locally dense. *Acacia paradoxa* is common and widespread. *Cassinia arcuata* is locally abundant. The weed, *Cotoneaster glaucophyllus*, is also abundant.

Vines and ferns: There are no wild indigenous vines or ferns.

Ground flora: Densely grassy, with rich lily flora. The following grasses are dominant, at least in patches: *Austrodanthonia racemosa*, *Austrodanthonia setacea*, *Austrodanthonia fulva*, *Microlaena stipoides* and *Themeda triandra*. The following species are also locally abundant: *Arthropodium strictum*, *Bulbine bulbosa*, *Lachnagrostis filiformis*, *Austrostipa oligostachya*, *Elymus scaber*, *Juncus subsecundus*, *Lomandra filiformis coriacea*, *Senecio quadridentatus* and *Tricoryne elatior*.

Creepline Grassy Woodland (EVC 68, **endangered** in the Gippsland Plain bioregion).

This EVC applies to Segments D and K, where the train tracks are elevated above a creek on an embankment (thereby greatly modifying the natural hydrology that is so important to Creepline Grassy Woodland).

Canopy trees: Dominated by *Eucalyptus ovata* and *Eucalyptus camaldulensis*, and notably with a single *Eucalyptus ?xstudleyensis*.

Grassy Woodland (EVC 175, **endangered** in the Gippsland Plain bioregion).

The strip between Ashburn Grove and the top of the cutting in Segment O supports a form of this EVC with a total area of roughly 500 m². However, the tree layer is intermediate between Grassy Woodland and Plains Grassy Woodland because the tree roots descend through the shallow layer of Tertiary sands (on which the Grassy Woodland relies) into the underlying Silurian siltstone that is more associated with Plains Grassy Woodland. The layer of Tertiary sands is less than 1½ metres deep at its thickest and is mostly less than one metre deep.

Canopy trees: Dominated by *Eucalyptus camaldulensis*, with far fewer *Eucalyptus melliodora* and *Eucalyptus viminalis* subsp. *pryoriana*.

Lower trees: *Acacia melanoxylon* is abundant and *Acacia mearnsii* is moderately common.

Shrubs: Dense in patches on the cutting embankment, which may reflect the Silurian geology beneath the natural ground level, rather than being a natural condition of Grassy Woodland at this location. *Acacia paradoxa* and *Cassinia arcuata* are the main species.

Vines and ferns: There are no wild indigenous vines or ferns.

Ground flora: Dominated by *Austrodanthonia geniculata*, *Austrostipa mollis*, *Lomandra nana* and *Lomandra filiformis* subsp. *coriacea*. *Austrodanthonia setacea* becomes abundant on the cutting embankment, perhaps reflecting the presence of the Silurian siltstone below the natural ground level. The other indigenous species that are present in substantial numbers are *Arthropodium strictum*, *Crassula decumbens*, *Crassula sieberiana* s.l., *Einadia nutans* and *Thelymitra arenaria*.

Habitat Scores

Segments A and B of this site have the least degraded native vegetation, and a habitat score was determined for each of these segments using the habitat hectare method (Section 2.3.4, page 13). The cutting embankment was excluded from the

scoring (except for the uppermost few tens of centimetres, with natural topsoil), so that the vegetation would be fairly uniform in botanical composition and ecological condition.

The area for habitat scoring in Segment A had dimensions of 150 m long × typically 6 m wide. The habitat score measured on 30/12/04 was 39%, the largest contributions being fifteen percentage points for understorey composition and eleven percentage points for lack of weeds. Taking into account the endangered status of the Plains Grassy Woodland vegetation involved, the score of 39% is just short of the 40% threshold for the vegetation to rise from 'High' to 'Very High' conservation significance under *Victoria's Native Vegetation Framework* (NRE 2002a).

The area for habitat scoring in Segment B had dimensions of 185 m long × typically 9 m wide. The habitat score measured on 30/12/04 was 35%, the largest contributions being fifteen percentage points for understorey composition and six percentage points each for both large trees and recruitment. The score was held back greatly by the abundance of grass weeds. If the cover of weeds were to be made comparable to Segment A, the score would rise to 46%.

Flora of special significance

The significant plant species below have been found in this site. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18). All species up to, and including, *Lachnagrostis aemula*, are rare or threatened in the Melbourne area, judging from the numbers of records in *Flora of Melbourne* (Gray & Knight 2001).

Conservation Status		Species Name	Last Record	Segment	Notes
Victoria	Boroondara				
Endangered	Critically Endangered	<i>Eucalyptus ?×studleyensis</i>	2005	K	One, as marked on p.288, in fair health, trunk diameter 30 cm; A specimen is held at Natl Herbarium of Vic.
Vulnerable	Critically Endangered	<i>Geranium solanderi</i> var. <i>solanderi</i> s.s.	2005	A	One only; Identified by L.P. Smith (the state geranium expert).
Rare	Endangered	<i>Geranium</i> sp. 3	2004	B	Several; Identified by L.P. Smith.
	Critically Endangered	<i>Austrostipa nodosa</i>	1977	?	Herbarium specimen of T.B. Muir.
	Critically Endangered	<i>Danthonia procera</i>	1990	D	Very scarce in 1990, not seen since.
	Critically Endangered	<i>Lomandra nana</i>	2005	O	Nineteen were counted.
	Critically Endangered	<i>Panicum effusum</i>	1990	A	Very scarce in 1990, not seen since.
	Critically Endangered	<i>Eucalyptus viminalis</i> subsp. <i>pryoriana</i>	2005	O-Q	The only stronghold of the species in Boroondara.
	Critically Endangered	<i>Leptorhynchus tenuifolius</i>	2006	A	Four plants present on the cutting.
	Critically Endangered	<i>Wahlenbergia multicaulis</i>	1976	?	Listed by Muir (1976).
	Endangered	<i>Austrostipa oligostachya</i>	2004	N	Over 100, but localised. Probably unique in the eastern suburbs.
	Vulnerable	<i>Lachnagrostis aemula</i>	1977	?	Herbarium specimen of T.B. Muir.
	Extinct	<i>Astroloma humifusum</i>	1990	C	Very scarce in 1990, not seen since.
	Critically Endangered	<i>Pteridium esculentum</i>	1990	K	Very scarce in 1990, not seen since.
	Critically Endangered	<i>Burchardia umbellata</i>	2004	A	Dangerously few.
	Critically Endangered	<i>Caesia calliantha</i>	2004	A	One only.
	Critically Endangered	<i>Dichelachne sciurea</i> spp. agg.	1976	?	Listed by Muir (1976).
	Critically Endangered	<i>Gahnia radula</i>	2005	E, Q	One in §E; Very scarce in §Q.
	Critically Endangered	<i>Hypoxis glabella</i> s.l.	1976	?	Listed by Muir (1976).
	Critically Endangered	<i>Hypoxis hygrometrica</i>	1990	A	Very scarce in 1990, not seen since.
	Critically Endangered	<i>Hypoxis ?vaginata</i>	1990	A, C	Scarce in 1990, not seen since.
	Critically Endangered	<i>Thelymitra arenaria</i>	2005	O	More than 70; Unique in Boroondara.
	Critically Endangered	<i>Wurmbea dioica</i>	1990	A, B	Scarce in 1990, not seen since.
	Critically Endangered	<i>Xanthorrhoea minor</i>	2005	B, C	Two only.
	Critically Endangered	<i>Cassinia aculeata</i>	2005	O	One only.
	Critically Endangered	<i>Exocarpos cupressiformis</i>	2005	P	Two only.
	Critically Endangered	<i>Kennedia prostrata</i>	2005	O	One only.
	Critically Endangered	<i>Leptorhynchus squamatus</i>	2004	A	Possibly only a single plant.
	Critically Endangered	<i>Opercularia ovata</i>	2005	A, C	Several in §A; two only in §C.
	Critically Endangered	<i>Opercularia varia</i>	1990	B	Very scarce in 1990, not seen since.
	Critically Endangered	<i>Ozothamnus ferrugineus</i>	2005	O	One plant, unexpectedly found on the rail embankment. Specimen retained.
	Critically Endangered	<i>Pimelea curviflora</i>	2005	A, E	Approx. five were seen in 2005.

Conservation Status		Species Name	Last Record	Segment	Notes
Victoria	Boroondara				
	Critically Endangered	<i>Pimelea humilis</i>	2005	A, B	Approx. four were seen in 2005.
	Endangered	<i>Austrostipa pubinodis</i>	2005	A,B,P	Moderate numbers.
	Endangered	<i>Bulbine bulbosa</i>	2004	A, B	Scarce in §A; Numerous in §B.
	Endangered	<i>Hemarthria uncinata</i>	1990	I, M	Scarce in 1990, not seen since.
	Endangered	<i>Luzula meridionalis</i>	1990	B	Very scarce in 1990, not seen since.
	Endangered	<i>Bossiaea prostrata</i>	2005	A, O	Estimated as 7 in §A and 3 in §O.
	Endangered	<i>Drosera peltata</i> subsp. <i>peltata</i>	1990	?	Cowdell (1990) gave no details.
	Endangered	<i>Eucalyptus ovata</i>	2005	B, C, D, K	The dominant species in Creekline Grassy Woodland; c. 20 individuals.
	Endangered	<i>Pseudognaphalium luteoalbum</i>	1990	D, I, K	Likely to appear seasonally from time to time.
	Endangered	<i>Senecio glomeratus</i>	2004	A, B	Moderate numbers.
	Endangered	<i>Senecio ?minimus</i>	1990	B	Very scarce in 1990, not seen since.
	Endangered	<i>Solanum laciniatum</i>	2005	K	Two only.
	Endangered	<i>Veronica gracilis</i>	1990	K	Very scarce in 1990, not seen since.
	Endangered	<i>Wahlenbergia communis</i>	1990	C, H	Very scarce in 1990, not seen since.
	Endangered	<i>Wahlenbergia gracilis</i>	2004	B	Very scarce in 2004.
	Vulnerable	<i>Austrodanthonia geniculata</i>	2005	A, B, M, O	Locally abundant.
	Vulnerable	<i>Austrodanthonia laevis</i>	2005	K	Locally dominant in the ground flora
	Vulnerable	<i>Austrodanthonia penicillata</i>	2004	A	One only.
	Vulnerable	<i>Austrodanthonia pilosa</i>	2005	A	Very scarce.
	Vulnerable	<i>Austrodanthonia ?tenuior</i>	2004	A	One plant, tending toward <i>A. fulva</i> .
	Vulnerable	<i>Austrostipa scabra</i> ssp. <i>falcata</i>	2005	A, B, H	Moderate numbers.
	Vulnerable	<i>Isolepis cernua</i> var. <i>platycarpa</i>	1990	?	Inferred from Cowdell (1990) to have been seen south of High St.
	Vulnerable	<i>Juncus pallidus</i>	2005	B, H, O, Q	Moderate numbers seen in 2005.
	Vulnerable	<i>Juncus subsecundus</i>	2005	A,M,Q	Numerous.
	Vulnerable	<i>Phragmites australis</i>	2004	M	In the trackside gutter.
	Vulnerable	<i>Poa morrisii</i>	2005	A, Q	Moderate numbers in §A; few in §Q.
	Vulnerable	<i>Schoenus apogon</i>	2004	A	Scarce in 2004, perhaps temporarily.
	Vulnerable	<i>Typha ?domingensis</i>	2004	B	One patch only.
	Vulnerable	<i>Acaena agnipila/ovina</i> complex	2005	A-D, K, N, O, Q	Abundant. The names <i>Acaena agnipila</i> var. <i>agnipila</i> and <i>Acaena ovina</i> var. <i>velutina</i> have been applied, but the author gives them low reliability.
	Vulnerable	<i>Eucalyptus melliodora</i>	2005	B, E, F, O	Moderate numbers.
	Vulnerable	<i>Euchiton collinus</i>	1990	D	Cowdell (1990) gave no details.
	Vulnerable	<i>Gonocarpus tetragynus</i>	2005	B, Q	Very few in §B; about 3 in §Q.
	Data Deficient	<i>Austrodanthonia caespitosa</i>	2005	A,C,F, O,P,Q	Moderate numbers; The stronghold of the species in Boroondara.
	Data Deficient	<i>Dianella longifolia</i> s.l.	2005	A,B, M,N,O	The population of wild individuals is clouded by the number of plantings.
	Data Deficient	<i>Barbula calycina</i>	2005	C, D	A moss, whose population is unclear.
	Data Deficient	<i>Bryoerythrophyllum binnsii</i>	2005	P	A moss, whose population is unclear.
	Data Deficient	<i>Campylopus introflexus</i>	2005	A, C, D,K,O	A moss, whose population is unclear.
	Data Deficient	<i>Macrocoma tenuis</i>	2005	O	A moss, whose population is unclear.
	Data Deficient	<i>Rhynchostegium tenuifolium</i>	2005	C	A moss, whose population is unclear.
	Data Deficient	<i>Thuidiopsis furfurosa/sparsa</i>	2005	C	A moss, whose population is unclear.
	Data Deficient	<i>Chiloscyphus semiteres</i>	2005	A, C	A liverwort, population unclear.

Full flora list

The table below shows plant species recorded in each of the site's Segments A to P. There are 105 distinct taxa in the list of wild indigenous species, which is very high by Boroondara's standards. A superscript 'AC' indicates that the record comes from Cowdell (1990), and a superscript 'BM' refers to Muir (1976). Underlined species names indicate useful seed sources.

In the grid squares:

- 'D' indicates a dominant species in the relevant stratum (i.e. canopy, lower trees, shrubs, ground flora);
- 'M' means that many plants were found (but not dominant);
- '✓' indicates moderate numbers; and
- '-' means that very few plants were found.

Wild Indigenous Species Name	Segment																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
<u>Acacia implexa</u>	-							✓			✓						
<u>Acacia mearnsii</u>	D		✓	✓						✓	✓	D	D		✓	D	D
<u>Acacia melanoxylon</u>	✓	✓	D	D		✓				D	D	D	✓	✓	D	D	D
<u>Acacia paradoxa</u>	✓	✓	✓					-		✓	M		M		✓		
<u>Acaena agnipila</u>	✓	✓															
<u>Acaena agnipila/ovina</u>			M	M							M				✓		M
<u>Acaena ovina var. velutina</u>																	
<u>Arthropodium strictum</u>	✓	M														M	
<u>Astroloma humifusum</u> ^{AC}																	
<u>Austrodanthonia caespitosa</u>	✓		✓			✓									✓	✓	✓
<u>Austrodanthonia fulva</u>	M	M	M	M	✓	✓	M	✓	M	D		✓	M	M	M	✓	M
<u>Austrodanthonia geniculata</u>	-	✓											✓		D		
<u>Austrodanthonia laevis</u>											D						
<u>Austrodanthonia penicillata</u>	-																
<u>Austrodanthonia pilosa</u>	-																-
<u>Austrodanthonia racemosa</u>	✓	M	D	D	✓		✓	✓	✓	D	D	✓	M			✓	✓
<u>Austrodanthonia setacea</u>	M	M	✓	✓	-	-	✓		-	✓	✓	✓	M	M	M	✓	✓
<u>Austrodanthonia ?tenuior</u>	-																
<u>Austrostipa mollis</u>															D	-	✓
<u>Austrostipa nodosa</u>																	
<u>Austrostipa oligostachya</u>														M			
<u>Austrostipa pubinodis</u>	-	✓															-
<u>Austrostipa rudis rudis</u>	✓	✓		✓													
<u>Austrostipa scabra falcata</u>	✓	✓															
<u>Barbula calycina</u>			✓	✓													
<u>Bossiaea prostrata</u>	✓															✓	
<u>Bryoerythrophyllum binnsii</u>																	✓
<u>Bulbine bulbosa</u>	-	M															
<u>Burchardia umbellata</u>	-																
<u>Bursaria spinosa</u>	-																-
<u>Caesia calliantha</u>	-																✓
<u>Campylopus introflexus</u>	✓		✓	✓							✓					✓	
<u>Cassinia aculeata</u>																	-
<u>Cassinia arcuata</u>	✓			-									M	✓	M		
<u>Chiloscyphus semiteres</u>	✓	✓															
<u>Cotula australis</u>		✓														✓	
<u>Crassula decumbens</u>																M	
<u>Crassula sieberiana</u> s.l.			✓									✓			M		
<u>Danthonia procera</u>				-													
<u>Dianella longifolia</u> s.l.	✓	✓											✓	✓			
<u>Dianella admixta</u>	✓	✓	✓														-
<u>Dichelachne crinita</u>	✓	✓	✓	M						-	✓	M		✓	✓	M	✓
<u>Dichelachne sciurea</u> ^{BM}																	
<u>Drosera peltata peltata</u> ^{AC}																	
<u>Einadia nutans</u>		✓	-				✓								M	M	✓
<u>Elymus scaber</u>	M	✓	✓	✓						✓	-						-

Wild Indigenous Species

Name	Segment																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
<i>Eucalyptus camaldulensis</i>	D	D	D	D	D	D	-	D	D	D	D	D	✓	D	D	D	D
<i>Eucalyptus melliodora</i>	✓				✓	✓										✓	
<i>Eucalyptus ovata</i>	✓	-	D								✓						
<i>Eucalyptus viminalis</i> subsp. <i>pryoriana</i>															✓	✓	✓
<i>Eucalyptus</i> ? <i>studleyensis</i>											-						
<i>Euchiton collinus</i> ^{AC}				✓													
<i>Exocarpos cupressiformis</i>																✓	
<i>Gahnia radula</i>					-												✓
<i>Geranium solanderi</i> var. <i>solanderi</i> s.s.	-																✓
<i>Geranium</i> sp. 3	✓																
<i>Gonocarpus tetragynus</i>	-																-
<i>Hemarthria uncinata</i> ^{AC}									✓				✓				
<i>Hypoxis glabella/vaginata</i> ^{AC}	-	-															
<i>Hypoxis hygrometrica</i> ^{AC}	-																
<i>Isolepis cernua</i> ssp.? <i>cernua</i> ^{AC}											-						
<i>Isolepis cernua platycarpa</i> ^{AC}																	-
<i>Juncus amabilis</i>																-	✓
<i>Juncus bufonius</i>	✓							✓					✓	✓	✓	✓	✓
<i>Juncus pallidus</i>	✓							✓								-	✓
<i>Juncus subsecundus</i>	✓												M				M
<i>Kennedia prostrata</i>																	-
<i>Lachnagrostis aemula</i>																	
<i>Lachnagrostis filiformis</i>																	-
<i>Leptorhynchos squamatus</i>	-																MM
<i>Leptorhynchos tenuifolius</i>	-																
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	M	✓	MM	✓	-					-	✓	✓	M	✓	MM		
<i>Lomandra nana</i>																	✓
<i>Luzula meridionalis</i> ^{AC}	-																
<i>Lythrum hyssopifolia</i> ^{AC}			✓										✓	✓			
<i>Macrocoma tenuis</i>																	✓
<i>Microlaena stipoides</i>	M	M	✓	✓					✓		-	✓	✓	✓	✓	✓	✓
<i>Muellerina eucalyptoides</i>	✓	✓	✓	✓	✓					✓	-						
<i>Opercularia ovata</i>	✓		✓														
<i>Opercularia varia</i> ^{AC}	-																
<i>Oxalis exilis/perennans</i>	✓	✓								✓	-		✓	-			
<i>Ozothamnus ferrugineus</i>																	-
<i>Panicum effusum</i> ^{AC}	-																
<i>Phragmites australis</i>													✓				
<i>Pimelea curviflora</i>	✓																-
<i>Pimelea humilis</i>	✓																-
<i>Poa morrisii</i>	✓																-
<i>Pseudognaphalium luteoalbum</i> ^{AC}				✓					✓		✓						
<i>Pteridium esculentum</i> ^{AC}												✓					
<i>Rhynchosyrium tenuifolium</i>				✓													
<i>Schoenus apogon</i>	-																
<i>Senecio glomeratus</i>	✓	✓															
<i>Senecio hispidulus</i> s.s.																	✓
<i>Senecio</i> ? <i>minus</i> ^{AC}	-																
<i>Senecio quadridentatus</i>	✓		✓	M						✓	MM			-	-		M
<i>Solanum laciniatum</i>																	-
<i>Thelymitra arenaria</i>																	✓
<i>Themeda triandra</i>	M	-	✓	✓					✓	✓				-	D		-
<i>Thuidiopsis furfurosa/sparsa</i>			✓														

Wild Indigenous Species

Name	Segment																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
<i>Tricoryne elatior</i>	M	✓	✓	✓							✓		M	M	✓		
<i>Typha ?domingensis</i>		-															
<i>Veronica gracilis</i> ^{AC}											-						
<i>Wahlenbergia ?communis</i> ^{AC}										-							
<i>Wahlenbergia gracilis</i>																	
<i>Wahlenbergia multicaulis</i> ^{BM}																	
<i>Wurmbea dioica</i> ^{AC}	✓	✓															
<i>Xanthorrhoea minor</i>		-	-														

Planted Indigenous Species

Name	Segment																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
<i>Acacia acinacea</i>		✓															
<i>Acacia pycnantha</i>		-															
<i>Allocasuarina littoralis</i>		-															
<i>Dichondra repens</i>			✓														
<i>Dodonaea viscosa</i>		-															
<i>Einadia nutans</i>			✓														
<i>Goodenia ovata</i>		✓	✓														
<i>Lomandra longifolia</i>			✓														
<i>Poa labillardierei</i>		✓	✓														

Weed Species

Name	Segment																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
<i>Acacia baileyana</i>	✓		-														
<i>Acacia longifolia longifolia</i>															✓		✓
<i>Acacia ?saligna</i>	✓	✓															
<i>Agapanthus praecox</i>			✓								M	✓	✓				
<i>Agrostis capillaris</i>	✓										✓	✓	✓				✓
<i>Aira caryophyllea</i>															✓		✓
<i>Aira sp.</i>	✓	✓	✓														
<i>Allium triquetrum</i>			✓	✓	✓					✓							✓
<i>Anthoxanthum odoratum</i>												-					
<i>Arbutus unedo</i>	✓																
<i>Arctotheca calendula</i>	✓																
<i>Avena barbata</i>	✓	✓											✓	✓			
<i>Avena sp.</i>			✓	✓						✓	✓			✓	✓	✓	✓
<i>Briza maxima</i>	✓	✓	M							✓	✓	✓	M	✓	✓	✓	✓
<i>Briza minor</i>	✓																
<i>Bromus catharticus</i>	✓											✓					
<i>Bromus diandrus</i>	✓	✓	✓	✓						✓		✓			✓	✓	✓
<i>Bromus hordeaceus</i>	✓																
<i>Centaurium erythraea</i>	✓	✓												✓	-		
<i>Centaurium tenuiflorum</i>	✓																
<i>Cerastium glomeratum</i>		✓															
<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	✓												✓	✓			
<i>Cirsium vulgare</i>												-					
<i>Clematis microphylla</i>	✓	M	✓								✓						
<i>Coprosma repens</i>	✓	✓		✓						-	✓				✓	✓	
<i>Cortaderia seloana</i>															✓		
<i>Cotoneaster glaucophyllus</i>			✓	✓	✓					✓	✓	✓	-		✓	✓	
<i>Cotoneaster pannosus</i>										✓	✓				✓	✓	
<i>Cotoneaster sp.</i>	✓	✓													✓		
<i>Crassula multicava</i>		✓		✓							-	✓					
<i>Cynodon dactylon</i>	✓		✓	✓						✓	✓	✓			✓		✓

Weed Species

Name	Segment																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
<i>Dactylis glomerata</i>	✓	✓	✓	✓						✓	✓	-					✓
<i>Ehrharta erecta</i>	✓	✓	✓	✓						✓	✓	✓	✓	✓	✓	✓	✓
<i>Ehrharta longiflora</i>		✓	✓	✓						✓	-	✓	✓	✓	✓	✓	
<i>Erica lusitanica</i>															✓	✓	
<i>Foeniculum vulgare</i>	✓	✓								✓	✓	-					
<i>Fraxinus angustifolia</i>	✓	✓	✓							✓	✓	✓	✓				
<i>Freesia hybrid</i>	✓																
<i>Fumaria sp.</i>		✓															
<i>Galium aparine</i>		✓	✓								✓						
<i>Genista linifolia</i>	✓									✓				✓			
<i>Genista monspessulana</i>			✓	✓	✓				✓	✓				✓	✓	✓	
<i>Grevillea robusta</i>		✓															
<i>Grevillea rosmarinifolia</i>															✓	✓	
<i>Holcus lanatus</i>	✓	✓	✓									-		✓		✓	
<i>Hypochoeris glabra</i>											✓		✓	✓			
<i>Hypochoeris radicata</i>	✓	✓									✓		✓	✓			
<i>Juncus capitatus</i>																	✓
<i>Leontodon taraxacoides</i>	✓																
<i>Lepidium africanum</i>										✓							
<i>Ligustrum lucidum</i>										✓							-
<i>Linum trigynum</i>											✓						
<i>Lolium perenne</i>		✓													✓		
<i>Lycium ferocissimum</i>													✓				
<i>Nassella leucotricha</i>											-						
<i>Nassella neesiana</i>		✓									-	-	✓				
<i>Nassella trichotoma</i>										-							
<i>Opuntia sp.</i>																	✓
<i>Oxalis incarnata</i>	✓		✓	✓						✓					✓		
<i>Oxalis pes-caprae</i>	✓	✓	✓	✓	✓					✓	✓	✓			✓	✓	
<i>Paraserianthes lophantha</i>		✓															
<i>Paspalum dilatatum</i>										✓	✓	✓	-	✓	✓		
<i>Pennisetum clandestinum</i>	✓	✓		D	D	D				✓	D	✓	D	✓	✓	✓	✓
<i>Petrorhagia dubia</i>																✓	
<i>Pinus radiata</i>		✓										-	✓	✓			-
<i>Pittosporum undulatum</i>	✓	✓	✓	✓	✓					✓	✓	✓			✓	✓	✓
<i>Plantago coronopus</i>	✓	✓															
<i>Plantago lanceolata</i>	✓	✓	✓	✓						✓	✓	✓	✓	✓	✓		
<i>Prunus cerasifera</i>	✓	✓	✓	✓						✓	✓	✓	✓				
<i>Quercus robur</i>	✓	✓	✓							✓	MM	✓	✓				
<i>Romulea rosea</i>	✓	✓	✓									✓	✓	✓			
<i>Rubus anglocandicans</i>	✓		✓	✓						MD	-						✓
<i>Silene gallica</i>	✓	✓											✓				
<i>Sollya heterophylla</i>											✓				✓		
<i>Sonchus oleraceus</i>	✓	✓	✓								-	-	✓	✓			
<i>Sporobolus africanus</i>	✓	✓	✓							✓			✓				
<i>Tradescantia fluminensis</i>				✓	✓					✓		✓				✓	-
<i>Tribolium acutiflorum</i> s.l.	✓														-		
<i>Trifolium angustifolium</i>	✓																✓
<i>Trifolium dubium</i>											✓						
<i>Ulex europaeus</i>				-						-	-					✓	✓
<i>Vicia hirsuta</i>	✓	✓									-	-			✓	✓	
<i>Vicia sativa</i>	✓	✓										✓			✓	✓	✓
<i>Vulpia bromoides</i>	✓	✓	✓	✓							✓	✓	✓	✓	✓	✓	
<i>Vulpia myuros</i>	✓		✓											✓	✓	✓	
<i>Watsonia meriana bulbifera</i>																	✓

Large old trees

Five River Red Gums (*Eucalyptus camaldulensis*) beside Welfare Parade and Ashburn Grove were found to qualify as large old trees according to the Department of Sustainability & Environment's criterion for Plains Grassy Woodland (i.e. trunk diameters of at least 0.8 m). These each have a yellow circle around them on the aerial photograph on page 288. From north to south, the trunk diameters at breast height measure 1.05 m, 1.01 m, 0.95 m, 0.88 m, and 0.89 m. The health of these trees in January 2006 was respectively very good, fair to good, fair to good, good and good.

Fauna of special significance

The significant fauna species in the list below were all observed by the author between Burwood and Alamein train stations during the fieldwork for this study. The conservation status ratings, vulnerable and endangered, are explained in Section 2.5.2 (page 18). No breeding of these species was confirmed.

Conservation Status in Boroondara	Species Name
Endangered	Crimson Rosella
Endangered	Spotted Pardalote
Vulnerable	Eastern Rosella

Full fauna list

The following list shows all fauna species recorded in the site during this study. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies	Frogs	Birds	†Noisy Miner
*Cabbage White	Common Froglet	*Spotted Turtle-Dove	Magpie-lark
Australian Admiral		Galah	Grey Butcherbird
Australian Painted Lady	Mammals	Rainbow Lorikeet	†Australian Magpie
Common Brown	Common Ringtail Possum	Crimson Rosella	†Little Raven
Common Grass-blue		Eastern Rosella	*House Sparrow
Klug's Xenica		Spotted Pardalote	*Common Blackbird
		Brown Thornbill	*Common Starling
		†Red Wattlebird	*Common Myna
		Brush Wattlebird	

Bird census results

One twenty-minute bird census was carried out as part of the bird survey by David Lockwood on 1st October 2004. He recorded six native species and three introduced species. The species with the highest counts were Noisy Miner (9), Red Wattlebird (6), Little Raven (3) and Spotted Turtle-dove (3). These figures indicate a typical suburban bird population.

Fauna habitat

The main habitat feature of the site for birds and flying insects is the tall trees, which include eucalypts and non-native species. These attract common birds such as the Eastern Rosella, Little Raven and Red Wattlebird. Additionally, the Noisy Miner was found nesting in a tall Yellow Box.

The linear nature of the site and its suburban surroundings favour the aggressive Red Wattlebird and Noisy Miner, which make it difficult for smaller bird species to persist here. Indeed, Noisy Miners were seen to harass even the large Little Raven.

The gutters beside the train tracks are occupied in places by the Common Froglet (*Crinia signifera*).

Site significance ratings

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Regionally threatened Ecological Vegetation Class

All of the EVCs present in this site are endangered. As the two habitat scores reported above for Segments A and B were 39% and 35% respectively, the conservation significance level of the native vegetation in those segments is 'High' by the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a).

According to BioSites criterion 3.2.3, **State** significance applies to any site with a 'remnant patch' whose conservation significance is High or Very High due to the presence of a threatened EVC. Although the native vegetation in this site is fragmented, the sections are sufficiently close together and with a sufficient total area to be treated as a remnant patch.

Rare or threatened plants

A single tree in Segment K is identified as *Eucalyptus ×studleyensis* with 80% confidence. *Eucalyptus ×studleyensis* is endemic to Victoria and is listed as endangered in Victoria. BioSites criterion 3.1.2 assigns **National** significance to ‘All sites for a taxon listed as critically endangered or endangered and endemic to Victoria’. However, it should be understood that this particular taxon is a hybrid between two very common species, and it could reappear spontaneously even if it becomes extinct. Although the identity of this tree is not certain, the precautionary principle guides us not to diminish its significance for lack of certainty.

The site also has viable, wild populations of numerous plant species that are threatened with extinction in Boroondara. The critically endangered and endangered species are *Lomandra nana*, *Eucalyptus viminalis pryoriana*, *Aurolistia oligostachya*, *Thelymitra arenaria*, *Leptorhynchus squamatus*, *Aurolistia pubinodis*, *Bulbine bulbosa*, *Eucalyptus ovata* and *Senecio glomeratus*. There are other species that are locally threatened at the lower level of ‘vulnerable’. Any one of these species would be enough to give the site **Local** significance according to BioSites criterion 3.1.5.

Threats

The following threats to the site’s ecological values are presented in a form to suit the Department of Sustainability & Environment’s ‘BioSites’ database.

Threat	Natural assets affected	Severity	When?
Indiscriminate use of herbicide on native vegetation, particularly beside Ashburn Grove.	Significant plant species, including <i>Thelymitra arenaria</i>	High	Recent; Potential
<p>Environmental weeds. The species of concern are:</p> <ul style="list-style-type: none"> • Very Serious: Panic Veldt-grass (<i>Ehrharta erecta</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Blackberry (<i>Rubus anglocandicans</i>); • Serious: Golden-wreath Wattle (<i>Acacia ?saligna</i>), Agapanthus (<i>Agapanthus praecox</i> subsp. <i>orientalis</i>), Brown-top Bent (<i>Agrostis capillaris</i>), Large Quaking-grass (<i>Briza maxima</i>), Great Brome (<i>Bromus diandrus</i>), Small-leafed Clematis (<i>Clematis microphylla</i>), Cotoneaster (<i>Cotoneaster glaucophyllus</i>), Cotoneaster (<i>Cotoneaster pannosus</i>), Cotoneaster (<i>Cotoneaster</i> sp.), Couch (<i>Cynodon dactylon</i>), Cocksfoot (<i>Dactylis glomerata</i>), Fennel (<i>Foeniculum vulgare</i>), Montpellier Broom (<i>Genista monspessulana</i>), Chilean Spear-grass (<i>Nassella neesiana</i>), Pale Wood-sorrel (<i>Oxalis incarnata</i>), Soursob (<i>Oxalis pes-caprae</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), English Oak (<i>Quercus robur</i>), Narrow-leaf Clover (<i>Trifolium angustifolium</i>), Gorse (<i>Ulex europaeus</i>), Tiny Vetch (<i>Vicia hirsuta</i>), Common Vetch (<i>Vicia sativa</i>), Squirrel-tail Fescue (<i>Vulpia bromoides</i>), Rat’s-tail Fescue (<i>Vulpia myuros</i>); • Moderately serious: Sallow Wattle (<i>Acacia longifolia</i> subsp. <i>longifolia</i>), Silvery Hair-grass (<i>Aira caryophyllea</i>), Hair Grass (<i>Aira</i> sp.), Angled Onion (<i>Allium triquetrum</i>), Sweet Vernal-grass (<i>Anthoxanthum odoratum</i>), Irish Strawberry Tree (<i>Arbutus unedo</i>), Bearded Oat (<i>Avena barbata</i>), Oat (<i>Avena</i> sp.), Prairie Grass (<i>Bromus catharticus</i>), Common Mouse-ear Chickweed (<i>Cerastium glomeratum</i> s.l.), Boneseed (<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>), Spear Thistle (<i>Cirsium vulgare</i>), Mirror-bush (<i>Coprosma repens</i>), Pampas Grass (<i>Cortaderia selloana</i>), Shade Crassula (<i>Crassula multicava</i> subsp. <i>multicava</i>), Spanish Heath (<i>Erica lusitanica</i>), Desert Ash (<i>Fraxinus angustifolia</i>), unidentified fumitory (<i>Fumaria</i> sp.), Cleavers (<i>Galium aparine</i>), Flax-leafed Broom (<i>Genista linifolia</i>), Yorkshire Fog (<i>Holcus lanatus</i>), Cat’s Ear (<i>Hypochoeris radicata</i>), Hairy Hawkbit (<i>Leontodon taraxacoides</i>), Common Pepper-cress (<i>Lepidium africanum</i>), Large-leafed Privet (<i>Ligustrum lucidum</i>), Perennial Rye-grass (<i>Lolium perenne</i>), African Box-thorn (<i>Lycium ferocissimum</i>), Pale Needle-grass (<i>Nassella leucotricha</i>), Serrated Tussock (<i>Nassella trichotoma</i>), Cape Wattle 	All	Moderate	Current

Threat	Natural assets affected	Severity	When?
(<i>Paraserianthes lophantha</i> subsp. <i>lophantha</i>), <i>Paspalum</i> (<i>Paspalum dilatatum</i>), Monterey Pine (<i>Pinus radiata</i>), Ribwort (<i>Plantago lanceolata</i>), Cherry-plum (<i>Prunus cerasifera</i>), Common Onion-grass (<i>Romulea rosea</i>), French Catchfly (<i>Silene gallica</i>), Bluebell Creeper (<i>Sollya heterophylla</i>), Indian Rat-tail Grass (<i>Sporobolus africanus</i>), Wandering Jew (<i>Tradescantia fluminensis</i>), Bulbil Watsonia (<i>Watsonia meriana</i> var. <i>bulbillifera</i>).			
Eucalypt dieback disease due to psyllids, leaf skeletonisers, leaf miners or galls. The damage is currently moderate and is likely to vary in intensity from time to time.	Endangered EVCs; birdlife; large old trees	High to moderate	Current
Overpopulation of the aggressive Noisy Miner and Red Wattlebird, displacing other species and possibly contributing to eucalypt dieback and general ecological imbalance.	Endangered EVCs; birdlife; large old trees	Moderate	Current
Trampling of native vegetation by pedestrians, particularly beside Ashburn Grove near High St.	Endangered EVCs; birdlife; rare plants	Moderate	Current
Precariously small populations of some plant species, causing vulnerability to inbreeding or chance events.	Significant flora	Moderate	Current
Borer attack of wattles.	Endangered EVCs	Low to moderate	Current

Priority actions

1. Take whatever action is necessary to prevent any further herbicide use or other damaging activity associated with the newly mulched bed directly opposite 9-13 Ashburn Grove, Ashburton. Plants such as Boroondara's only population of Forest Sun-orchid are gravely threatened by maintenance of this mulched area. Ideally, some of the mulch should be removed on the western edge and hand weeding undertaken to allow some of the rare ground flora to recover. **This action is of very high urgency and importance on a municipal scale.**
2. Use grass-specific herbicide to control grass weeds in the conservation enclosures of Segments A and B. The importance and urgency of this action are high, from the perspective of the whole municipality.
3. Prepare and deliver a message to neighbours along the railway line to make them aware of this site's significance and the amount of environmental damage being done by inappropriate garden plantings and dumping of garden waste. The importance of this action is high and the urgency moderate, from the perspective of the whole municipality.
4. Control the localised infestations of the following grass weeds:
 - Chilean Needle-grass (*Nassella neesiana*): Many at the top of the cutting beside Prosper Pde between Hortense and Montana Sts; Several opposite 1 Montana St; thirteen plants opposite 10 Prosper Pde; several plants opposite 38 Prosper Pde; and one plant near the gate at the south end of the conservation enclosure near the Dion St bridge. **Take great care to minimise inadvertently spraying *Austrostipa oligostachya* in the first of these locations;**
 - One square metre of Pale Needle-grass (*Nassella leucotricha*) beside the shared path where it passes the end of Yuile St;
 - Several Serrated Tussock plants opposite 12 Kelvin Grove.

The urgency of this action is high and the importance is moderate in the context of the whole municipality.
5. Collect seeds or cutting material from scarce species and arrange their propagation. Propagated plants can be used to replace their parents if they die, and can be exchanged with nearby sites that have the same species, to allow outbreeding. The author has already collected seeds of *Austrostipa oligostachya* and *Caesia calliantha*, and the other main species to focus on are *Eucalyptus ?xstudleyensis*, *Geranium solanderi*, *Gonocarpus tetragynus*, *Wahlenbergia gracilis* and *Xanthorrhoea minor*. The urgency of this action is moderate and the importance is high in the context of the whole municipality.
6. In the event that Priority Action 3 does not bring about a cessation of rubbish dumping between High St and 19 Ashburn Grove, consider installing a fence. This may be desirable for public safety, as well as nature conservation.

Management and revegetation

See the priority actions above and the section headed 'site description' on page 288.

As indicated by Frood (1989), fire would be beneficial for the native vegetation in certain parts of the site (e.g. Segments A and B). However, there are serious practical obstacles, and there is a risk of exacerbating weeds if the timing and intensity of a burn are not right. Note that *Ehrharta erecta* flourishes after fire, and annual weeds flourish after autumn burns.

Records should be kept of any planting done in this site, including species, numbers and locations (using the segment letters as adopted here from Cowdell (1990)).

Monitoring

Frood (1989) and Cowdell (1990) provide data about plant species and vegetation condition that provide an indication of changes that have occurred in the intervening fifteen years.

Cowdell (p. 11) describes a ‘thick patch’ of Early Nancy (*Wurmbea dioica*) in Segment B, vulnerable to invasion by grass weeds. Grass weeds have proliferated since and no Early Nancy plants could be found in 2004. However, this species is variable from year to year and may well reappear, particularly if grass weeds are controlled as recommended in Priority Action 5 above.

Cowdell’s data for Segments C and D (west of the tracks, south of the Dion St bridge) indicate considerably richer vegetation than remains there now. He stated, ‘The northern half of [Segment D] is relatively weed-free’, whereas in 2004, the author recorded Segment D as having only a 2½-metre-wide strip of native vegetation, all in poor ecological condition (rating ‘D’ on the A to D scale described in Section 2.3.4). This stretch shows signs of having suffered from indiscriminate herbicide use, mowing and garden plantings in recent years.

Cowdell (1990) did not consider Running Postman (*Kennedia prostrata*) vulnerable in Segment O (just south of High St), so the reduction to a single plant in 2004 indicates a serious decline in that species. Landslip and dumping of garden waste are threatening the remaining plant, suggesting that the other plants of this species may have succumbed to the same threats. If so, plants of many other species could also have succumbed. This may explain why *Bulbine bulbosa* and *Wurmbea dioica* appear to have died out in Segment O.

The following items have been gathered to provide a baseline for future monitoring, to complement the earlier reports:

- The plant lists for the site’s eighteen segments, as presented beneath the heading ‘Full flora list’ above. Repeat every four years or so. Check for loss or decline of indigenous species;
- Population sizes of the indigenous plant species listed in the section headed ‘Flora of special significance’. Precise locations of the plants are mapped in the author’s file of field data. Check the populations every two to four years;
- Ratings of the level of threat or impact of each weed species, as provided in the table headed ‘Threats’ above. Check for clear changes in the seriousness of each weed species;
- The habitat scores that were determined for Segments A and B. Repeat every two to four years and check for changes in habitat score and the reasons why they have occurred. The original field data sheets from this study are kept with the author’s file of field data. Repeat every four years (approximately) and look for changes in each of the features examined as part of the scoring process;
- Vegetation condition mapping using the A to D scale described in Section 2.3.4, stored in the author’s file of field data. Check a sample of locations every four years (approximately);
- The fauna list and bird survey, including a twenty-minute bird census. Repeat in spring every four to eight years. Check for changes in the abundance of birds (particularly aggressive honeyeaters), the particular species present and the species that are breeding;

The various infestations of the serious weeds in the genus *Nassella*, discussed in Priority Action 4 above, were notified to the City of Boroondara soon after the author discovered them. Once the weeds are initially destroyed, their locations should be monitored each late November for several years, to allow follow-up of the next generation.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of 23 hours and 45 minutes on 11/10/04, 12/10/04, 18/10/04, 21/10/04 and 30/12/04, using this study’s standard approach described in Section 2.3. This included:
 - Compilation of seventeen lists of wild introduced and indigenous plant species, each list including a measure of the abundance of each indigenous species and the threat level of all weed species;
 - Determination of habitat scores for each of Segments A and B;
 - Mapping of the condition of the native vegetation on the A to D scale in Section 2.3.4;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Weed mapping;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;

- Dr Lorimer’s recollections of the site from a botanical inspection in summer, 1989-90, with A.W. Cowdell;
- A daytime bird survey of the site by David Lockwood on 1/10/04 according to the protocol discussed in Section 2.4.1, including a twenty-minute bird census;
- Lynlee P. Smith (the state’s geranium expert), who confirmed the identity of the author’s specimens of geranium from this site;
- Inspection of herbarium specimens of various species at the National Herbarium of Victoria, and discussion with the staff there (Jeff Jeanes and John Reid) about the identifications of specimens collected during this study and by previous investigators;
- Records of plant specimens collected from the site, extracted from the National Herbarium of Victoria’s MELISR database;
- Reports:
 - Cowdell A.W. (1990). ‘*Priorities for Conservation of Remnant Bushland in the Alamein Railway Reserve: Burwood – Ashburton*’. Published by Green Link Camberwell. 26 pp.;
 - Frood, D (1989). ‘*The Management of Remnant Vegetation at Welfare Parade, Hartwell*’. Report to Camberwell Council. 288 pp + 3 loose A3 maps;
 - Muir T.B. (1976). Australian plants still survive on Burwood-Alamein railway reserve in eastern suburbs of Melbourne. *Victorian Naturalist* **93**:180-181;
 - Outer Circle Study Group (1988). ‘*Outer Circle Railway: A Plan for a Linear Park*’. Published jointly by the Ministry of Planning & Environment and the Department of Conservation, Forests & Lands. 140 pp.;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment’s BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

It would be a useful project to collect and propagate seed from the tree believed to be a *Eucalyptus* ×*studleyensis*. If some seedlings turn out to belong to *Eucalyptus camaldulensis* and others to *Eucalyptus ovata*, this would confirm the identity of the tree and its National significance.

Site 31. Outer Circle Railway Corridor

Rail reserve along the Alamein line and its extension, and linear parkland along the former Outer Circle Railway line. Melway references are as follows:

- Ryburne Av to Alamein Station, Ashburton: 69 C1 to 60 D11;
- Burwood Station to the junction with the Belgrave and Lilydale lines: 60 D6 to 46 B11;
- Boroondara Park to High St, Kew: 46 B11 to 45 H4.

Site Biological Significance Level: *Local* (potentially State if three Yellow Gums are natural)

Summary of the most significant natural assets:

- Apparently viable populations of three plant species and one bird species that are threatened in Boroondara;
- A tiny, degraded remnant of Grassy Woodland, which is highly endangered in Boroondara.

Boundaries

This site contains the seventeen sections outlined in red on the aerial photographs shown on this page and the next. The boundaries follow cadastral boundaries wherever practical. The precise boundaries are available in the Geographic Information System file that was prepared in association with this report.

Land use & tenure

Crown Land from Whitehorse Rd to Canterbury Rd; City of Boroondara amenity park to the north of Whitehorse Rd, as well as within Boroondara Park and Frog Hollow Reserve; and rail reserve elsewhere (disused south of Alamein Station).

Physical features

Site area: 23 hectares in total, comprising 3.5 ha south of the Alamein Station, 4.9 ha between Burwood Station and the Lilydale & Belgrave lines, and 12.7 ha from Boroondara Park to High St, Kew.

Landform: Gently undulating terrain, crossing drainage lines and low ridges.

Slope: Variable, undulating, steep only on rail cuttings and embankments.

Elevation: The lowest points are in drainage lines near St Georges Crescent, Ashburton (at an elevation of 31 m) and near Toorak Rd, Camberwell (34 m). The highest point is at Mont Albert Rd, with an elevation of 84 m.

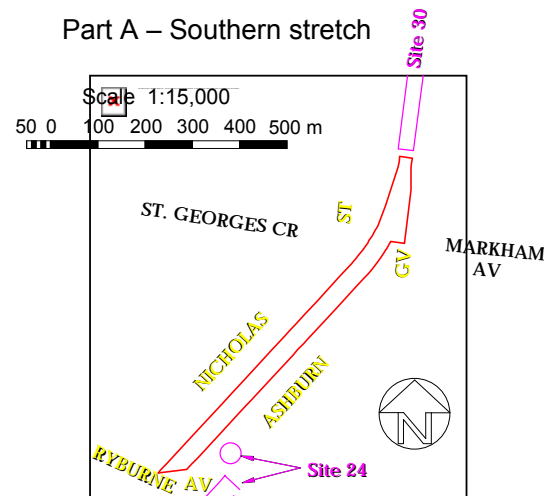
Soil type: Shallow alluvium in the drainage lines, Tertiary sands on the ridges, and pale loam with clay subsoil elsewhere.

Underlying geology: The ridge tops have poorly consolidated Tertiary sands of the Red Bluff group. Elsewhere, the bedrock is Silurian sedimentary rock of the Andersons Creek Formation, dominated by siltstone.

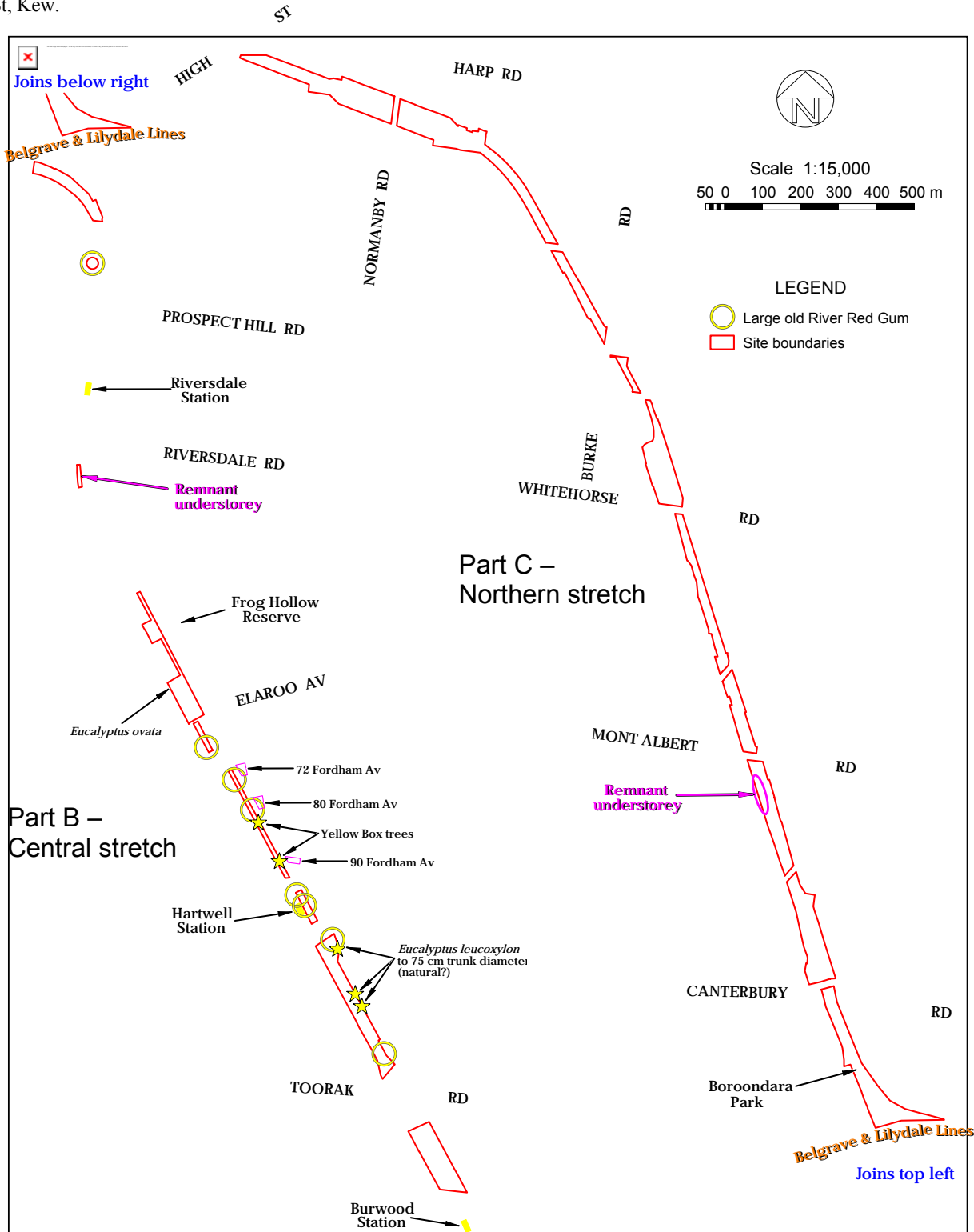
Site description

Three aerial photographs are needed to illustrate this site. The one on the right depicts the southernmost stretch, from Ryburne Avenue, Ashburton, in the south to just south of the Alamein station. This section has overhead electricity lines for a railway but no remaining tracks. The original level of the tracks lies within a cutting in the southern half and on top of an earth embankment in the northern half. As is usually the case in transport corridors, the least degraded native vegetation occurs in the vicinity of the tops of the cuttings. The only location where there is indigenous ground flora of any note is behind 101 and 103 Nicholas St, Ashburton, where there is just 15 m² with several native grass species, *Lomandra filiformis* and *Oxalis exilis/perennans*. The stands of Yellow Box (*Eucalyptus melliodora*, a locally vulnerable species) on the highest ground are significant. Eucalypt dieback is serious along this stretch, associated with leaf skeletonisers.

Site 31 is interrupted from Alamein Station to Burwood station, which is separated as Site 30 because of its State biological significance. Site 31 continues to the north of Burwood Station, depicted on the two strips of aerial photograph on the next page. The left-hand strip extends from Burwood Station to



Boroondara Park in Canterbury. It overlaps slightly with the right-hand strip, which extends to the end of the site at High St, Kew.



The 200m-long section of the site immediately north of Burwood Station contains very few indigenous trees or shrubs, but there is an abundance of indigenous wallaby-grasses on the western side of the tracks, growing in a patch of wasteland. There is also a single plant of the locally rare indigenous wildflower, Pink Bindweed (*Convolvulus angustissimus*), growing amid the weeds Kikuyu (*Pennisetum clandestinum*) and Ribwort (*Plantago lanceolata*).

The eastern side of the tracks from Toorak Rd to Hartwell Station has a somewhat fragmented canopy of remnant eucalypts with a shrub layer comprising the indigenous *Acacia paradoxa* and many woody weeds. There are also some patches of

ground flora dominated by indigenous grasses (mainly wallaby-grasses). Among the canopy trees are two large Yellow Gums (*Eucalyptus leucoxylon*), which seem out of place but would represent State significance if they can be established to be natural. Until the 1990s, a trackside gutter near Hartwell Station supported the Southern Toadlet, which is now listed as vulnerable across Victoria.

The density of indigenous vegetation generally declines from Hartwell Station to High St, Kew. From Hartwell Station to just north of Elaroo Avenue, there is a fragmented row of mature River Red Gums (*Eucalyptus camaldulensis*) and occasional Yellow Box (*Eucalyptus melliodora*). The understorey is reduced to occasional Blackwood (*Acacia melanoxylon*) and Black Wattle (*Acacia mearnsii*) trees.

Frog Hollow Reserve, Camberwell, has a mixture of sparse remnant plants and planted indigenous and non-indigenous species on the rail embankment. There is only one small strip (60 m × 5 m) of natural understorey from there to just before the Belgrave and Lilydale rail line. This strip is marked on Part B of the set of aerial photographs (page 303), just south of Riversdale Rd, between the tracks and a row of conifers beside Westbourne Grove, Camberwell. The strip contains high densities of remnant wattles, native grasses and the Yellow Rush-lily (*Tricoryne elatior*), threatened by cotoneasters and Panic Veldt-grass (*Ehrharta erecta*).

On the bend as the train tracks approach the Belgrave and Lilydale line, there are scattered River Red Gums, a fairly high density of Blackwoods and a Black Wattle.

Boroondara Park has some scattered indigenous trees (notably a cluster of twenty-one live stems of the Lightwood, *Acacia implexa*, near the Canterbury Rd bridge) as well as some large trees from other parts of Australia and overseas, all in a parkland setting. The Australian Hobby is known to occur in the park, finding vantage points in the tall trees and communications masts.

Remnant vegetation from Canterbury Rd to High St, Kew, is extremely scant. The only area with indigenous ground flora is a tiny strip (roughly 50 m × 2 m) on top of a cutting just south of Mont Albert Rd, as marked on the aerial photograph as 'remnant understorey'. This strip is tiny and overrun by declared noxious weeds, but it is quite biologically significant because it has Boroondara's only three plants of the sedge, *Lepidosperma gunnii*, and it represents a significant fraction of the tiny amount of Grassy Woodland left in Boroondara. Grassy Woodland once covered almost half the municipality, and now it is down to a handful of tiny, degraded patches such as this one.

The remnant vegetation from Whitehorse Rd to High St, Kew comprises a single, large Blackwood at Kitchener St, five Sweet Bursarias (*Bursaria spinosa*) just east of Burke Rd, and a few remnant River Red Gums near Campbell St. There is also a large, old River Red Gum on adjacent private land at 21 Goldthorns Avenue, listed as Tree 43 in the 'significant Tree Study' report by John Patrick Pty Ltd in 2001. Despite the paucity of remnant vegetation, there is extensive revegetation with indigenous and Australian native plants along the Outer Circle reserve from Whitehorse Rd to High St, Kew, particularly toward the western end. The first revegetation plantings were for the opening of the Outer Circle Linear Park in July, 1991, and were followed by several subsequent planting projects until quite recently. Unfortunately, the beds are mostly so narrow and provide so little cover for small birds that they attract aggressive urban birds such as wattlebirds and Noisy Miners at the expense of more desirable species.

Ecological links with other land

Sites 30 and 31 are simply different sections of one linear reserve. Collectively, they provide a moderately continuous corridor of indigenous trees from Gardiners Creek to the Burwood Station, and a somewhat more fragmented corridor of indigenous trees from Burwood Station to Frog Hollow Reserve in Camberwell. The corridor has a gap of approximately 300 metres across Toorak Rd.

One might expect the corridor of trees to function to some degree as a wildlife corridor for native birds and flying insects. However, no real evidence of corridor usage by native birds was found by either the author or David Lockwood during this study. The indigenous bird species that were found are typical of suburban areas without any corridors. Evidence of corridor usage by fauna might be found during a longer investigation, but Lockwood and the author both found evidence of corridor usage with less effort at other, less promising sites.

The most likely way in which the site may facilitate movement of fauna is not along the site but at right angles. Back Creek, which crosses the site near Toorak Rd, does appear likely to function as a wildlife corridor for some significant bird species (see the descriptions of Site 28 and Site 29), and the trees within Site 31 may provide an effective 'stepping stone' for those birds.

Habitat types

Plains Grassy Woodland (EVC 55, **endangered** in the Gippsland Plain bioregion).

Prior to settlement, this EVC occurred most of the way from Ryburne Avenue to Canterbury Rd, except for two short sections of Creekline Grassy Woodland and one short section of Grassy Woodland. It would also have occurred in the

vicinity of High St, Kew. The only locations with any remnant ground flora of note are just south of Riversdale Rd and between Hartwell Station and Toorak Rd.

Canopy trees: *Eucalyptus camaldulensis* with a small number of *Eucalyptus melliodora*, plus three *Eucalyptus leucoxylon* trees (discussed above) that may be remnants of the pre-European vegetation.

Lower trees: *Acacia mearnsii* and *Acacia melanoxylon* are fairly common.

Shrubs: Indigenous shrubs are extremely scarce, limited to a small number of *Bursaria spinosa* near Ryburne Avenue. Shrub weeds such as *Cotoneaster glaucophyllus* are abundant.

Vines and ferns: There are no wild indigenous vines or ferns.

Ground flora: The tiny, degraded vestiges of ground flora are densely grassy. Wallaby-grasses are consistent, the most common being *Austrodanthonia racemosa*, *Austrodanthonia fulva* and *Austrodanthonia setacea* (in decreasing order of abundance). *Elymus scaber*, *Microlaena stipoides* and *Themeda triandra* are present but very localised. *Tricoryne elatior* is present in the least degraded patches.

Creepline Grassy Woodland (EVC 68, **endangered** in the Gippsland Plain bioregion).

This EVC once occurred in gullies near Elaroo Av, Toorak Rd and just south of St Georges Crescent in Ashburton. The only remnants of indigenous vegetation are a small number of trees, many of them affected by dieback.

Canopy trees: Dominated by *Eucalyptus camaldulensis*, with a single specimen of the characteristic species, *Eucalyptus ovata*, at Willison Park.

Lower trees: *Acacia mearnsii* and *Acacia melanoxylon* share dominance.

Grassy Woodland (EVC 175, **endangered** in the Gippsland Plain bioregion).

Prior to settlement, this EVC occurred from Canterbury Rd, Canterbury to near Normanby Rd in Kew, plus a short stretch on the hilltop 100-150 m from Ryburne Avenue in Ashburton. The only location with any remnant ground flora (other than hardy native grasses) is just south of Mont Albert Rd.

Canopy trees: Dominated by *Eucalyptus melliodora* and *Eucalyptus camaldulensis*.

Lower trees: *Acacia implexa*, *Acacia melanoxylon* and *Acacia mearnsii* are each locally common.

Shrubs: Remnant shrubs have been reduced to a cluster of five *Bursaria spinosa* near Whitehorse Rd.

Vines and ferns: There are no wild indigenous vines or ferns.

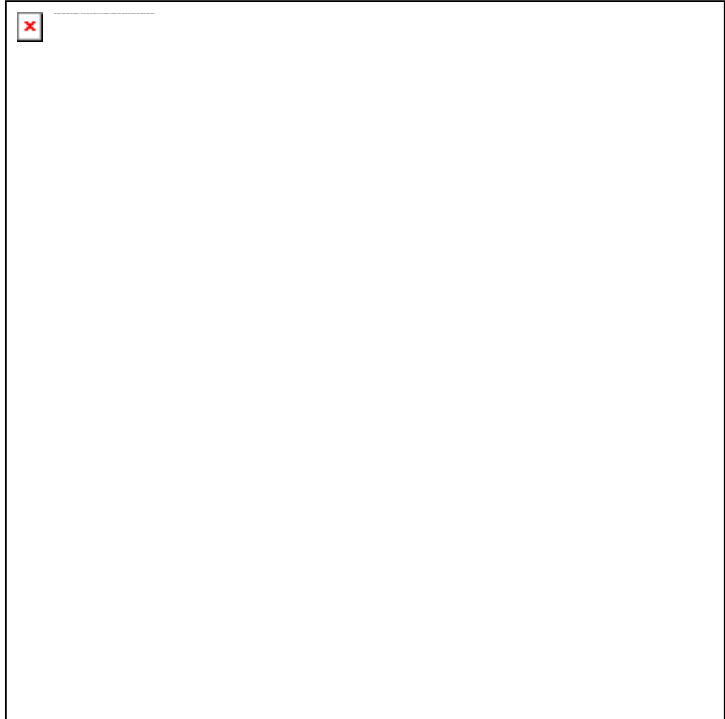
Ground flora: The characteristic grassy ground flora are represented only by common wallaby-grasses (particularly *Austrodanthonia racemosa*, a moderate number of *Tricoryne elatior*, a few *Themeda triandra* and *Lomandra filiformis*, and Boroondara's only three plants of *Lepidosperma gunnii* (just south of Mont Albert Rd).

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status			Species Name	Last Record	Notes
Victoria	Melbourne	Boroondara			
Vulnerable	Rare or threatened	Vulnerable	<i>Eucalyptus leucoxylon</i>	2005	3 trees south of Hartwell Station.
	Rare or threatened	Critically Endangered	<i>Panicum effusum</i>	1947	Collected near the former Deepdene Train Station.
		Critically Endangered	<i>Lepidosperma gunnii</i>	2005	3 plants opposite 'The Ridge', just south of Mont Albert Rd.
		Critically Endangered	<i>Asperula scoparia</i>	1967	Collected St George Crescent, Ashburton.
		Endangered	<i>Hemarthria uncinata</i>	1947	Collected near the former Deepdene Train Station.
		Endangered	<i>Convolvulus angustissimus</i>	2004	1 plant ~5 m west of tracks just north of Burwood Station, level with front of 11 Straughan St.
		Endangered	<i>Eucalyptus ovata</i>	2005	1 tree in fair health at Willison Reserve.
		Vulnerable	<i>Austrodanthonia laevis</i>	2004	Localised near Ryburne Av.
		Vulnerable	<i>Juncus subsecundus</i>	2005	Near Hartwell Stn; very scarce.
		Vulnerable	<i>Eucalyptus melliodora</i>	2005	Locally dominant; also scattered.
		Data Deficient	<i>Austrodanthonia caespitosa</i>	2005	Scattered thinly from Ryburne Av to Hartwell Station.

It is not yet clear whether the three *Eucalyptus leucoxylon* trees are natural or not. The size of the larger two (trunk diameters to 75 cm) indicate that if they have been planted, they must have been among the earliest plantings of Australian species in Melbourne. Efforts to establish the trees' status with more confidence are continuing. The tree near the shops southeast of Hartwell Station, with a trunk diameter of 63 cm, is illustrated at right.



One of three *Eucalyptus leucoxylon* trees to the southwest of Hartwell Station, with Hartwell Hill Rd in the background. Note the healthy crown and trunk.

Full flora list

The species recorded in the site are listed below, excluding lawn and ornamental plantings. Thirty-eight species appear to be wild indigenous species. However, the two species marked with an obelisk (†), namely *Acacia pycnantha* and *Eucalyptus leucoxylon*, may be present only due to planting. The columns headed A to G represent different parts of the site, as follows:

- A = Ryburne Avenue to Alamein Station;
- B = Burwood Station to Toorak Rd;
- C = Toorak Rd to 72 Fordham Av, Camberwell;
- D = 72 Fordham Av to the Lilydale and Belgrave train lines;
- E = Tiny patch of remnant ground flora just south of Riversdale Rd;
- F = Boroondara Park to Whitehorse Rd;
- G = Whitehorse Rd to High St, Kew.

The codes in the grid cells are as follows:

- 'X' is for species no longer present, but collected in 1947-1967, with a specimen at the National Herbarium of Victoria;
- 'D' indicates a dominant species in the relevant stratum (i.e. canopy, lower trees, shrubs, ground flora);
- 'M' means that many plants were found (but not dominant);
- '✓' indicates moderate numbers; and
- '-' means that very few plants were found.

Name	— Segment —						
	A	B	C	D	E	F	G
Wild Indigenous Species							
<i>Acacia implexa</i>				✓	✓		
<i>Acacia mearnsii</i>	D	✓	✓	✓	D	✓	
<i>Acacia melanoxylon</i>	D	✓	✓	✓	M	✓	-
<i>Acacia paradoxa</i>	✓	✓	✓				
† <i>Acacia pycnantha</i>	X						
<i>Asperula scoparia</i>	✓						
<i>Austroanthonia caespitosa</i>	✓	-					
<i>Austroanthonia fulva</i>	✓	M	-		M		
<i>Austroanthonia laevis</i>	✓						
<i>Austroanthonia racemosa</i>	M	✓	M		D	✓	
<i>Austroanthonia setacea</i>	✓	M	-		✓		
<i>Austrostipa mollis</i>	X						
<i>Austrostipa rudis</i> ssp. <i>rudis</i>	✓						
<i>Bursaria spinosa</i>	✓						-
<i>Convolvulus angustissimus</i>		-					
<i>Dichelachne crinita</i>			✓				
<i>Elymus scaber</i>		✓					

Name	— Segment —						
	A	B	C	D	E	F	G
<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>		✓					
<i>Epilobium hirtigerum</i>		M					
<i>Eragrostis brownii</i>						X	
<i>Eucalyptus camaldulensis</i>	D	D	D			-	-
† <i>Eucalyptus leucoxylon</i>		-					
<i>Eucalyptus melliodora</i>	D	-					
<i>Eucalyptus ovata</i>			-				
<i>Hemarthria uncinata</i>						X	
<i>Juncus subsecundus</i>			-				
<i>Lachnagrostis filiformis</i>		✓					
<i>Lepidosperma gunnii</i>							-
<i>Lomandra filiformis coriacea</i>	✓						
<i>Microlaena stipoides</i>					✓		
<i>Muellerina eucalyptoides</i>	✓	-					
<i>Oxalis exilis/perennans</i>	-		-				-
<i>Panicum effusum</i>						X	
<i>Portulaca oleracea</i>				M			M
<i>Senecio hispidulus</i>	✓						
<i>Senecio quadridentatus</i>		✓					

Name	— Segment —						
	A	B	C	D	E	F	G
<i>Themeda triandra</i>	✓						
<i>Tricoryne elatior</i>				✓	✓		

Planted Indigenous Species

<i>Acacia acinacea</i>							✓
<i>Acacia implexa</i>							✓
<i>Acacia mearnsii</i>							✓
<i>Acacia melanoxylon</i>							✓
<i>Acacia pycnantha</i>							✓
<i>Acacia stricta</i>							✓
<i>Allocasuarina littoralis</i>							✓
<i>Austroanthonia setacea</i>							✓
<i>Banksia marginata</i>							✓
<i>Bursaria spinosa</i>							✓
<i>Callistemon ?citrinus</i>							✓
<i>Clematis microphylla</i>							✓
<i>Corymbia maculata</i>							✓
<i>Dianella longifolia</i> s.l.							✓
<i>Dodonaea viscosa</i>							✓
<i>Eucalyptus camaldulensis</i>							✓
<i>Eucalyptus melliodora</i>			-				✓
<i>Goodenia ovata</i>							✓
<i>Goodia lotifolia</i>							✓
<i>Kunzea ericoides</i> s.l.							✓
<i>Lomandra longifolia</i>							✓
<i>Melicytus dentatus</i>							✓
<i>Microlaena stipoides</i>							✓
<i>Poa labillardierei</i>							✓
<i>Viminaria juncea</i>							✓

Name	— Segment —						
	A	B	C	D	E	F	G

Weed Species

<i>Allium triquetrum</i>	✓						
<i>Avena</i> sp.	✓						
<i>Briza maxima</i>	✓		✓				
<i>Bromus diandrus</i>	✓						
<i>Centaureum erythraea</i>			✓				
<i>Chamaecytisus palmensis</i>							✓
<i>Cotoneaster glaucophyllus</i>	✓		-		-		
<i>Cotoneaster pannosus</i>	✓		-		M		
<i>Crataegus monogyna</i>	✓						
<i>Cynodon dactylon</i>			✓				
<i>Ehrharta erecta</i>	✓		M	M	M	M	
<i>Ehrharta longiflora</i>	✓						
<i>Foeniculum vulgare</i>	✓	M					
<i>Fraxinus angustifolia</i>	✓						
<i>Genista linifolia</i>			✓				
<i>Genista monspessulana</i>	✓	✓	M				✓
<i>Hedera helix</i>	✓						
<i>Hypochoeris radicata</i>	✓						
<i>Ipomoea indica</i>							-
<i>Juncus capitatus</i>	✓						
<i>Lotus subbiflorus</i>		M					
<i>Oxalis incarnata</i>	✓						
<i>Pennisetum clandestinum</i>	✓	D	M	D		M	
<i>Pitosporum undulatum</i>	✓		✓				
<i>Prunus cerasifera</i>	✓						✓
<i>Quercus robur</i>	✓						✓
<i>Rubus anglocandicans</i>		✓	✓				✓
<i>Salpichroa origanifolia</i>	✓						
<i>Ulex europaeus</i>	✓		✓				✓
<i>Vinca major</i>	✓						

Large old trees

Eight River Red Gums (*Eucalyptus camaldulensis*) in the site were found to qualify as large old trees according to the Department of Sustainability & Environment's criterion for woodlands dominated by Red Gums (i.e. trunk diameters of at least 0.8 m). These trees each have a yellow circle around them on the aerial photograph on page 303. Their details are tabulated below. Two trees were not measured for safety reasons.

Location	Trunk diameter	Health
Beside Wandin Rd, north of Prospect Hill Rd, Camberwell	86 cm	Good
Willison Park, south of the railway bridge, Camberwell		Very good
Opposite 72 Fordham Avenue, Camberwell	87 cm	Good
Opposite 80 Fordham Avenue, Camberwell	84 cm	Good
Northern end of Hartwell Station, east of the building	92 cm	Good
Southern end of Hartwell Station, east of the building	136 cm	Good
In parkland opposite shops, just southeast of Hartwell Station	97 cm	Good
East side of tracks, opposite Bright St, Hartwell		Good

Fauna of special significance

The significant fauna species in the list below have been observed in this site. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
Endangered	Near Threatened	Occasional Visitor	Swift Parrot	1987
Vulnerable	Vulnerable	Occasional Visitor	Black Falcon	1986
Vulnerable	Secure	Extinct	Southern Toadlet [†]	1991
	Rare	Occasional Visitor	Fork-tailed Swift	1986
		Critically Endangered	Tussock Skink	1961
		Critically Endangered	Bougainville's Skink	1961
		Endangered	Spotted Pardalote	2001
		Endangered	Red-browed Finch	1987
		Vulnerable	Little Pied Cormorant	2001
		Vulnerable	Australian Hobby	2003
		Vulnerable	Musk Lorikeet	2004
		Vulnerable	Eastern Rosella	2005
		Vulnerable	Laughing Kookaburra	2001
		Vulnerable	White-browed Scrubwren	2005
		Vulnerable	Eastern Spinebill	2001
		Vulnerable	Grey Shrike-thrush	2001
		Vulnerable	Grey Fantail	2001
		Occasional Visitor	Gang-gang Cockatoo	2001
		Occasional Visitor	White-throated Needletail	1986
		Occasional Visitor	Striated Thornbill	2001

[†] Improbable though it may seem, the record of Southern Toadlet is quite reliable. Biologist, Paul Peake, observed a colony of the toadlets over successive autumns in the trackside gutter beside George St, Hartwell. He has not found them since the 1990s, despite checking in more recent autumns.

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies		Birds		†Brush Wattlebird	2005
*Cabbage White	2004	Little Pied Cormorant	2001	Noisy Miner	2005
Australian Painted Lady	2004	Australian Hobby	2003	White-plumed Honeyeater	2004
Common Brown	2005	Black Falcon	1986	Eastern Spinebill	2001
Common Grass-blue	2005	*Rock Dove	2004	Grey Shrike-thrush	2001
		*Spotted Turtle-Dove	2005	Magpie-lark	2005
		Gang-gang Cockatoo	2001	Grey Fantail	2001
Frogs		Sulphur-crested Cockatoo	1986	Willie Wagtail	2004
†Southern Toadlet	1991	Rainbow Lorikeet	2005	Grey Butcherbird	2005
		Musk Lorikeet	2004	Australian Magpie	2005
		Eastern Rosella	2005	Pied Currawong	2001
Reptiles		Swift Parrot	1987	Little Raven	2005
Tussock Skink	1961	White-throated Needletail	1986	*House Sparrow	2004
Bougainville's Skink	1961	Fork-tailed Swift	1986	Red-browed Finch	1987
		Laughing Kookaburra	2001	Welcome Swallow	2004
		Spotted Pardalote	2001	Silvereye	2005
Mammals		White-browed Scrubwren	2005	*Common Blackbird	2005
Common Brushtail Possum	2004	†Brown Thornbill	2005	*Common Starling	2004
		Striated Thornbill	2001	*Common Myna	2005
		†Red Wattlebird	2005		

Bird census

David Lockwood carried out a twenty-minute bird census in the vicinity of Burke Rd, Kew, on 3rd October 2004, as part of his bird survey of this site. He recorded seven native species and three introduced species. The species with the highest counts were Common Myna (14), Red Wattlebird (9), Noisy Miner (6) and Brush Wattlebird (6). These figures indicate a typical suburban bird population.

These results and conclusion are quite similar to the twenty-minute bird census conducted between Alamein and Ashburton Stations for Site 30. (Recall that Site 30 is part of the same linear reserve as Site 31.)

Bird habitat

The native plantings west of Burke Rd provide minimal benefit to native birds because of their narrow, linear arrangement and the nature of the surrounding residential area, which favours the presence of the Common Myna (*Acridotheres tristis*). The flowering grevilleas attract Brush and Red Wattlebirds, which would drive small insectivorous birds away from areas of dense native shrubbery that would otherwise be available to them. The broad-leafy European style between Burke Road and Boroondara Park does provide a refuge from the aggressive wattlebirds, as well as feeding habitat for the Brown Thornbill (*Acanthiza pusilla*) (which breeds there) and White-browed Scrubwren. The bridges crossing the trail provide roosting areas for the introduced Rock Dove (*Columba livia*).

Site significance ratings

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Regionally threatened Ecological Vegetation Classes

All of the site's three original EVCs are now endangered, but they are represented by such heavily modified vegetation that the BioSites criteria for threatened EVCs are not met.

Rare or threatened plants

The site has viable, wild populations of *Austrodanthonia laevis*, *Eucalyptus melliodora* and *Lepidosperma gunnii*, which are locally threatened. Such species give the site **Local** significance according to BioSites criterion 3.1.5.

If the three trees of *Eucalyptus leucoxylon* can be established to be natural occurrences (as suggested by a trunk diameter of 75 cm), they represent a population of a subspecies that is endemic to Victoria and listed as vulnerable. This would represent State significance under BioSites criterion 3.1.2.

Rare or threatened fauna

The only significant fauna listed above that was observed to have a contemporary, viable, resident population is the White-browed Scrubwren. This represents **Local** significance according to BioSites criterion 3.1.5.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Large Quaking-grass (<i>Briza maxima</i>), Great Brome (<i>Bromus diandrus</i>), Tree Lucerne (<i>Chamaecytisus palmensis</i>), Cotoneaster (<i>Cotoneaster pannosus</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Fennel (<i>Foeniculum vulgare</i>), Montpellier Broom (<i>Genista monspessulana</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Cherry-plum (<i>Prunus cerasifera</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Blackberry (<i>Rubus anglocandicans</i>), Pampas Lily-of-the-Valley (<i>Salpichroa organifolia</i>), Gorse (<i>Ulex europaeus</i>); • Moderately serious: Angled Onion (<i>Allium triquetrum</i>), Cotoneaster (<i>Cotoneaster glaucophyllus</i>), Hawthorn (<i>Crataegus monogyna</i>), Couch (<i>Cynodon dactylon</i>), Desert Ash (<i>Fraxinus angustifolia</i>), Flax-leafed Broom (<i>Genista linifolia</i>), Ivy (<i>Hedera helix</i>), Cat's Ear (<i>Hypochoeris radicata</i>), Lear's Morning-glory (<i>Ipomoea indica</i>), Hairy Bird's-foot Trefoil (<i>Lotus subbiflorus</i>), Pale Wood-sorrel (<i>Oxalis incarnata</i>), English Oak (<i>Quercus robur</i>), Blue Periwinkle (<i>Vinca major</i>). 	All	Moderate	Current
Eucalypt dieback disease due to psyllids, leaf skeletonisers, leaf miners or galls. This is particularly bad south of Alamein Station.	Trees; bird habitat	Moderate	Current
The aggressive wattlebirds, Common Mynas and Noisy Miners displacing indigenous bird species.	Birds	Moderate	Current
Precariously small wild populations of <i>Bursaria spinosa</i> , <i>Convolvulus angustissimus</i> , <i>Eucalyptus leucoxylon</i> , <i>Eucalyptus ovata</i> , <i>Juncus subsecundus</i> and <i>Lepidosperma gunnii</i> , vulnerable to inbreeding or other threats.	Significant flora	Moderate	Current

Threat	Natural assets affected	Severity	When?
Predation of birds and lizards by foxes and cats.	Birds and lizards	Low to Moderate	Current

Priority actions

1. Control the environmentally serious infestations of Gorse, Tagasaste, Blackberry and Kikuyu opposite The Ridge, just south of Mont Albert Rd (see aerial photograph, page 303). Great care is needed not to damage the remnant Grassy Woodland, which contains Boroondara's only three plants of *Lepidosperma gunnii* and represents a substantial fraction of the municipality's total area of this endangered EVC. The use of sprays should be minimised, e.g. by using cut-and-paint application of appropriate herbicide. **The urgency and importance of this action are high** in the context of the whole municipality.
2. Destroy cotoneasters (mainly *Cotoneaster pannosus*) in the tiny remnant of native vegetation beneath conifers, just south of Riversdale Rd, beside Westbourne Grove, Camberwell. Also spray grass-specific herbicide on *Ehrharta erecta* encroaching into the remnant, taking care to minimise damage to indigenous grasses. The urgency and importance of this action are moderate in the context of the whole municipality.
3. Control the *Ipomoea* vines that are smothering the cluster of five *Bursaria spinosa* plants behind 972 Burke Rd, Balwyn (near Gordon St). These *Bursarias* are the only remnant shrubs in the site, north of Hartwell Station. The urgency and importance of this action are moderate in the context of the whole municipality.
4. Collect seeds from *Bursaria spinosa*, *Convolvulus angustissimus* and *Lepidosperma gunnii*, and arrange their propagation. Add *Eucalyptus leucoxylon* to the list if the three trees in the site are established to be wild (see 'Further investigation' below). Propagated plants can be used to replace their parents if they die, and can be exchanged with nearby sites that have the same species, to allow outbreeding. The urgency and importance of this action are moderate in the context of the whole municipality.

Past management and revegetation

See the section headed 'site description', starting on page Site 31.

Future revegetation

Between Whitehorse Rd and High St, Kew, broadening the existing narrow strips of indigenous trees and shrubs (where practicable) may attract additional small insectivorous bird species, or at least provide additional habitat for the Brown Thornbill and White-browed Scrubwren. Suitable shrub species include Snowy Daisy-bush (*Olearia lirata*), Victorian Christmas-bush (*Prostanthera lasianthos*), Common Cassinia (*Cassinia aculeata*), Tree Everlasting (*Ozothamnus ferrugineus*) and Myrtle Wattle (*Acacia myrtifolia*).

Monitoring

The following items have been gathered to provide a baseline for future monitoring:

- Eight plant lists, as presented beneath the heading 'Full flora list' above. Repeat every four years or so. Check for loss or decline of wild indigenous species and the abundance of each weed species;
- Ratings of the level of threat or impact of each weed species within each of the eight parts of the site, as provided in the table headed 'Threats' above. Check for clear changes in the seriousness of each weed species;
- Population sizes of the indigenous plant species listed in the section headed 'Flora of special significance'. Check the populations of the following species every two to four years: *Convolvulus angustissimus*, *Eucalyptus leucoxylon*, *Eucalyptus ovata* and *Lepidosperma gunnii*. The locations of the three *Eucalyptus leucoxylon* trees are mapped on the aerial photograph on page 303;
- The photograph of the *Eucalyptus leucoxylon* in the section headed 'Flora of special significance' above, which shows the structure of the tree and the density of its foliage, with no signs of dieback;
- The fauna list and bird survey, including a twenty-minute bird census. Repeat in spring every four to eight years. Check for changes in the abundance of birds (particularly aggressive honeyeaters), the particular species present and the species that are breeding. This task should ideally be repeated every two to four years.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of approximately six hours on 18th October 2004 and 8th, 9th and 11th March 2005, using this study's standard approach described in Section 2.3. This included:
 - Walking or cycling along the entire route from Ryburne Avenue to High St, Kew, in both directions;

- Compilation of eight lists of wild introduced and indigenous plant species, each list including a measure of the abundance of each species and the threat level of each weed species;
- Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
- Weed mapping;
- Incidental fauna observations; and
- Checks for fauna habitat, ecological threats and management issues;
- Records of plant specimens collected from the site, extracted from the National Herbarium of Victoria's MELISR database;
- The 'City of Boroondara Significant Tree Study' by Patrick (2001) – see the Bibliography;
- A daytime bird survey of the site by David Lockwood on 3/10/04 according to the protocol discussed in Section 2.4.1, including a twenty-minute bird census;
- Discussion with biologist Paul Peake about his observations of Southern Toadlet just south of Hartwell train station;
- The report of the Outer Circle Study Group (1988): '*Outer Circle Railway: A Plan for a Linear Park*'. Published jointly by the Ministry of Planning & Environment and the Department of Conservation, Forests & Lands. 140 pp.;
- Aerial photography from August 2004;
- Information from the Department of Sustainability & Environment's fauna database;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

It is important to establish whether the three *Eucalyptus leucoxylon* trees are natural or not, if possible. The trees are of State significance if they are natural. An expert on eucalypts has been approached to assist, but he was unavailable during this study.

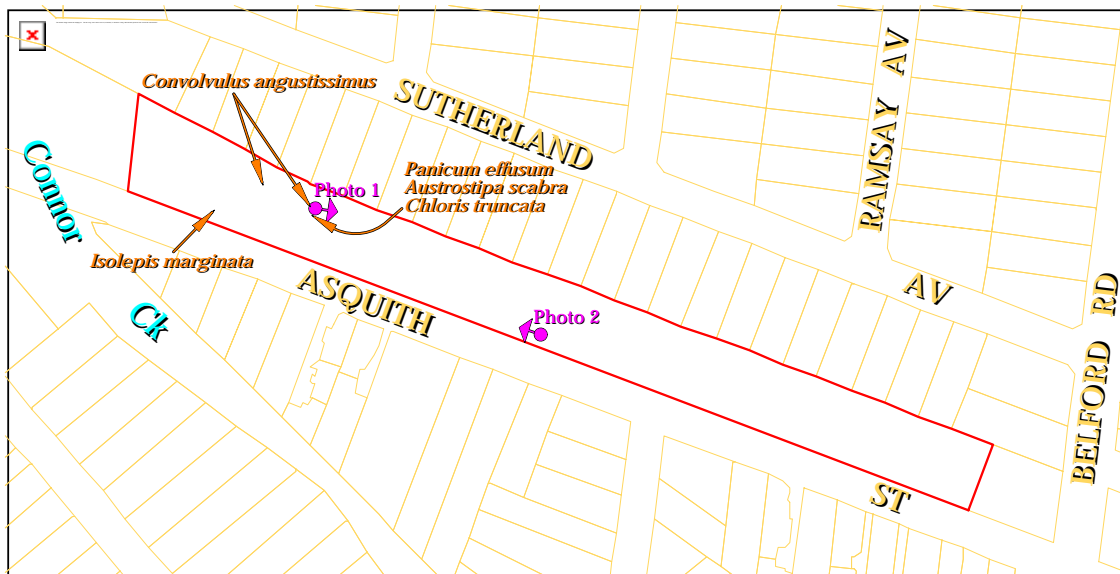
Site 32. Outer Circle Linear Park at Asquith Street, Kew

Long-disused railway embankment that has patches of remnant ground flora and River Red Gums on its slopes. Melway ref. 45 F4.

Site Biological Significance Level: *Local*

Summary of the most significant natural assets:

- Viable populations of at least three plant species that are threatened in Boroondara.



The site is outlined in red and the areas outlined in white are patches of indigenous ground flora.



Scale 1:3,000
10 0 20 40 60 80 100 m

Boundaries

This site is outlined in red on the aerial photograph above. The lateral boundaries are property boundaries and the ends are straight lines positioned so as to enclose all the River Red Gums in this stretch of rail reserve.

Land use & tenure

City of Boroondara reserve, for amenity, pedestrian use and conservation. There are plans to build an arterial road through the site.

Physical features

Site area: 1.2 hectares.

Elevation: 26 m at the western end (beside a drainage line) to 39 m at the eastern end.

Landform: The natural landform was the lower slope of a shallow valley. Now, the landform is dominated by an embankment that was constructed for the Outer Circle Railway to cross Connor Creek just to the west.

Slope: The slope each side of the railway embankment is very steep (1:1 in places). There is very little slope where the railway tracks once lay, and the natural slope below the embankment has an average gradient of 1:30.

Soil type: Introduced to the site for the construction of the railway, probably comprising a pale loam.

Underlying geology: The bedrock is Silurian sedimentary rock of the Dargile Formation, which is dominated by sandstone.

Site description

In the 1880s, an embankment was constructed on this site to provide the elevation needed for the Outer Circle Railway to cross over Connor Creek, where a bridge was constructed. The railway operated from 1891 until 1897.

The tracks and bridge have long since gone, and Connor Creek has been replaced by an underground pipe. However, some of the indigenous plant species that were abundant at the time of the railway have persisted on the embankment's slopes. There are very few indigenous plants where the tracks and ballast once lay.

The remnant indigenous vegetation comprises patches of ground flora as well as scattered Blackwoods (*Acacia melanoxylon*) and River Red Gums (*Eucalyptus camaldulensis*). Some of the trees may be over a century old, having trunk diameters to 76 cm. There are also recent plantings of indigenous trees and understorey species (including some species not suited to the site, such as the strictly riparian River Bottlebrush, *Callistemon sieberi*).

As can be seen from the areas outlined in white on the aerial photograph, the remnant ground flora is very patchy and is concentrated toward the west. The species present are typical of moderately degraded examples of a form of the endangered Plains Grassy Woodland.

Ecological links with other land

Revegetation and Australian native trees along the route of Connor Creek provide a tenuous ecological connection to Victoria Park (Site 37) and the Boroondara General Cemetery (Site 38) (both ½ km to the southeast), and the Yarra River corridor at Willsmere Park (Site 9, 800 m to the north). Some native forest birds, such as the Eastern Rosella, Brown Thornbill and Spotted Pardalote, are likely to move along this route and spend some time in the trees beside Asquith Street.

Habitat types

Plains Grassy Woodland (EVC 55, **endangered** in the Gippsland Plain bioregion). An estimated 1,550 m² has >10% native understorey cover (outlined in white on the aerial photograph on page 312), in poor ecological condition (rating D) except for 50 m² in fair ecological condition (rating C). Twenty wild indigenous plant species were found.

Canopy trees: *Eucalyptus camaldulensis* to 17 m tall and with trunk diameters to 0.76 m (mostly c. 0.5 m).

Lower trees: A few very old *Acacia melanoxylon* at the eastern end of the site.

Shrubs, vines and ferns: No remnant shrubs, vines or ferns remain. Several shrub species have been planted, but they are mainly of species that do not occur naturally in Plains Grassy Woodland.

Ground flora: Dominated by the native grass, *Austrodanthonia racemosa*, combined with *Austrodanthonia setacea* on the southern embankment slope. Other locally abundant species include *Austrostipa scabra* (north side), *Elymus scaber* (south side), *Microlaena stipoides* and *Tricoryne elatior*. The characteristic species, *Chloris truncata*, *Convolvulus angustissimus*, *Dichelachne crinita*, *Panicum effusum* and *Themeda triandra* are also present.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18). Locations are mostly marked on the aerial photograph.

Conservation Status		Species Name	Notes
Melbourne	Boroondara		
Rare or threatened	Critically Endangered	<i>Panicum effusum</i>	3 plants found, almost unique in Boroondara.
	Critically Endangered	<i>Chloris truncata</i>	Moderately common.
	Endangered	<i>Convolvulus angustissimus</i>	Seven plants found.
	Vulnerable	<i>Austrostipa scabra</i> ssp. <i>falcata</i>	Localised but fairly numerous (>20).
	Vulnerable	<i>Isolepis marginata</i>	Moderate numbers.
	Vulnerable	<i>Poa morrisii</i>	Scarce.
	Vulnerable	<i>Acaena agnipila</i>	Numbers not recorded.

Full flora list

The species found in the site in November 2004 are listed below. The column headed 's' is for species on the southern side of the site and the column headed 'N' is for plants on the northern side. In the grid squares for wild indigenous species, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found. Underlined species represent valuable seed sources.

Species Name	S	N	Species Name	S	N	Species Name	S	N
Wild indigenous species			<u><i>Austrostipa scabra</i> ssp. <i>falcata</i></u>		✓	<i>Isolepis marginata</i>	✓	
<i>Acacia melanoxylon</i>		✓	<u><i>Chloris truncata</i></u>		✓	<i>Lomandra filiformis coriacea</i>	✓	✓
<u><i>Acaena agnipila</i></u>	✓		<u><i>Convolvulus angustissimus</i></u>		✓	<i>Microlaena stipoides</i>	M	✓
<i>Austrodanthonia fulva</i>	✓	✓	<u><i>Dichelachne crinita</i></u>	-	-	<i>Oxalis exilis/perennans</i>	✓	-
<i>Austrodanthonia racemosa</i>	D	D	<i>Elymus scaber</i>	✓		<u><i>Panicum effusum</i></u>		-
<i>Austrodanthonia setacea</i>	D	✓	<i>Eucalyptus camaldulensis</i>	D	D	<u><i>Poa morrisii</i></u>	-	

Species Name	S	N	Species Name	S	N	Species Name	S	N
<i>Senecio quadridentatus</i>	✓		<i>Stylidium armeria</i>		✓	<i>Oxalis incarnata</i>	✓	
<i>Themeda triandra</i>	-	-	<i>Themeda triandra</i>		✓	<i>Plantago lanceolata</i>	✓	✓
<i>Tricoryne elatior</i>	✓	✓	Introduced species			<i>Romulea rosea</i>	✓	✓
Planted species			<i>Agrostis capillaris</i>	✓		<i>Rubus ?anglocandicans</i>	✓	
<i>Acacia mearnsii</i>	✓		<i>Aira caryophylla</i>	✓	✓	<i>Sporobolus africanus</i>		✓
<i>Acacia melanoxydon</i>	✓	✓	<i>Anthoxanthum odoratum</i>	✓	✓	<i>Tragopogon porrifolius</i>		✓
<i>Acaena novae-zelandiae</i>		✓	<i>Avena barbata</i>	✓	✓	<i>Trifolium angustifolium</i>		✓
<i>Allocasuarina verticillata</i>	✓		<i>Briza maxima</i>	✓	✓	<i>Trifolium campestre</i>		✓
<i>Austrodanthonia fulva</i>		✓	<i>Briza minor</i>	✓		<i>Ulex europaeus</i>	✓	✓
<i>Callistemon sieberi</i>		✓	<i>Bromus catharticus</i>		✓	<i>Vicia hirsuta</i>		✓
<i>Cassinia longifolia</i>		✓	<i>Centaurium erythraea</i>	✓		<i>Vulpia bromoides</i>	✓	✓
<i>Goodenia ovata</i>	✓	✓	<i>Cynodon dactylon</i>	✓		<i>Vulpia myuros</i>	✓	✓
<i>Goodia lotifolia</i>	✓	✓	<i>Dactylis glomerata</i>	✓	✓			
<i>Indigofera australis</i>		✓	<i>Ehrharta erecta</i>	✓	✓			
<i>Kunzea ericoides</i> s.l.	✓		<i>Ehrharta longiflora</i>	✓	✓			
<i>Lomandra longifolia</i>		✓	<i>Festuca arundinacea</i>		✓			
<i>Melaleuca ericifolia</i>	✓		<i>Holcus lanatus</i>	✓	✓			
<i>Melicytus dentatus</i>		✓	<i>Hypochoeris radicata</i>	✓	✓			
<i>Prostanthera lasianthos</i>		✓	<i>Lepidium africanum</i>	✓				

Fauna of special significance

The only significant fauna species recorded for the site is the Eastern Rosella, a pair of which were observed by the author in this study. This species is vulnerable in Boroondara, the meaning of which is explained in Section 2.5.2 (page 18).

Full fauna list

The following bird species were observed by the author during his inspection of the site. Asterisks indicate introduced species.

*Spotted Turtle-Dove	Red-rumped Parrot	Brush Wattlebird	*Common Myna
Rainbow Lorikeet	Brown Thornbill	Noisy Miner	
Eastern Rosella	Red Wattlebird	Australian Magpie	

Site significance ratings

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Regionally threatened Ecological Vegetation Class

The Plains Grassy Woodland EVCs is threatened, but it is represented in this site by such heavily modified vegetation that the BioSites criteria for threatened EVCs are not met.

Rare or threatened plants

The site has viable, wild populations of at least three locally threatened species of plant (see 'Flora of special significance'). Such species give the site **Local** significance according to BioSites criterion 3.1.5.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Sweet Vernal-grass (<i>Anthoxanthum odoratum</i>), Bearded Oat (<i>Avena barbata</i>), Large Quaking-grass (<i>Briza maxima</i>), Squirrel-tail Fescue (<i>Vulpia bromoides</i>); • Moderately serious: Brown-top Bent (<i>Agrostis capillaris</i>), Silvery Hair- 	All	Moderate	Current

Threat	Natural assets affected	Severity	When?
grass (<i>Aira caryophylllea</i>), Prairie Grass (<i>Bromus catharticus</i>), Couch (<i>Cynodon dactylon</i>), Cocksfoot (<i>Dactylis glomerata</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Yorkshire Fog (<i>Holcus lanatus</i>), Cat's Ear (<i>Hypochoeris radicata</i>), Common Peppercress (<i>Lepidium africanum</i>), Pale Wood-sorrel (<i>Oxalis incarnata</i>), Ribwort (<i>Plantago lanceolata</i>), Common Onion-grass (<i>Romulea rosea</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Indian Rat-tail Grass (<i>Sporobolus africanus</i>), Gorse (<i>Ulex europaeus</i>), Tiny Vetch (<i>Vicia hirsuta</i>), Rat's-tail Fescue (<i>Vulpia myuros</i>).			
Precariously small populations of <i>Panicum effusum</i> and <i>Poa morrisii</i> , causing vulnerability to inbreeding or chance events.	Significant flora	Low to Moderate	Current
Road widening: There is a proposal to extend the Chandler Hwy into this site.	All	High	Potential

Past management and revegetation

A substantial number of indigenous plants have been planted in the last few years. The species are listed under the heading 'Full flora list' above.

Future revegetation

Future revegetation should pay attention to the rapid draining of the embankment and the consequent low availability of soil moisture in summer. Species that are naturally confined to wet soil or riverbanks are unsuitable. Suitable species can be selected from the list for Plains Grassy Woodland in Appendix C.

The species listed in the section headed 'Flora of special significance' above should be incorporated into future revegetation plans, except perhaps for the annual species, *Isolepis marginata*, whose long-term security would not be significantly helped by a one-off planting. Seed could be collected from the site, and/or sought from Yarra Bend Park.

Monitoring

The following items have been gathered to provide a baseline for future monitoring:

- A plant list for each side of the site, as presented beneath the heading 'Full flora list' above. Repeat every two to four years. Check for loss or decline of indigenous species and changes in the seriousness of each weed species;
- Ratings of weed severity, separately for the northern and southern sides of the site, stored in this study's database. Check in conjunction with the previous item;
- Population sizes of wild indigenous plant species, as indicated in the section headed and 'Flora of special significance'. The locations of less abundant species are mapped on the aerial photograph on page 312. Check the populations every two to four years in conjunction with the previous two items;
- The monitoring photographs displayed on the next page, with locations and orientations shown on the aerial photograph on page 312. Original digital images are available separately. Repeat the photographs about every four years, checking for weed growth and the features mentioned in the captions.

Information sources used in this assessment

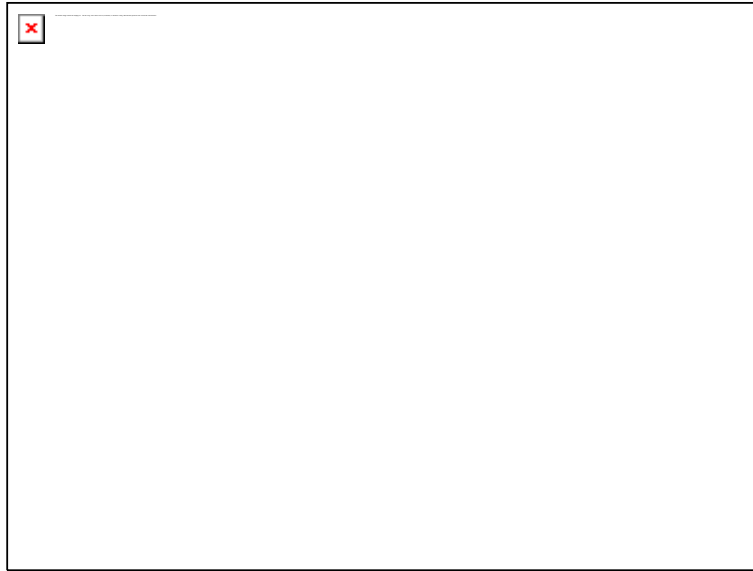
- A vegetation and habitat survey by Dr Lorimer for a total of three hours on 10th & 16th November 2004, using this study's standard approach described in Section 2.3. This included:
 - Compilation of two lists of wild introduced and indigenous plant species, including all indigenous species' abundances and the threat level of all weed species in each area;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

The only further investigations recommended for this site are provided in the section headed 'Monitoring' above.

Monitoring photographs, taken on 16th November 2004.

The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 312.



Site 32, Photo 1, to show the density of native grasses and Large Quaking-grass at the epicentre of locally threatened plants, as well as the foliage density of the River Red Gums.



Site 32, Photo 2, showing the extensive cover of introduced grass in one section of the southern embankment slope.

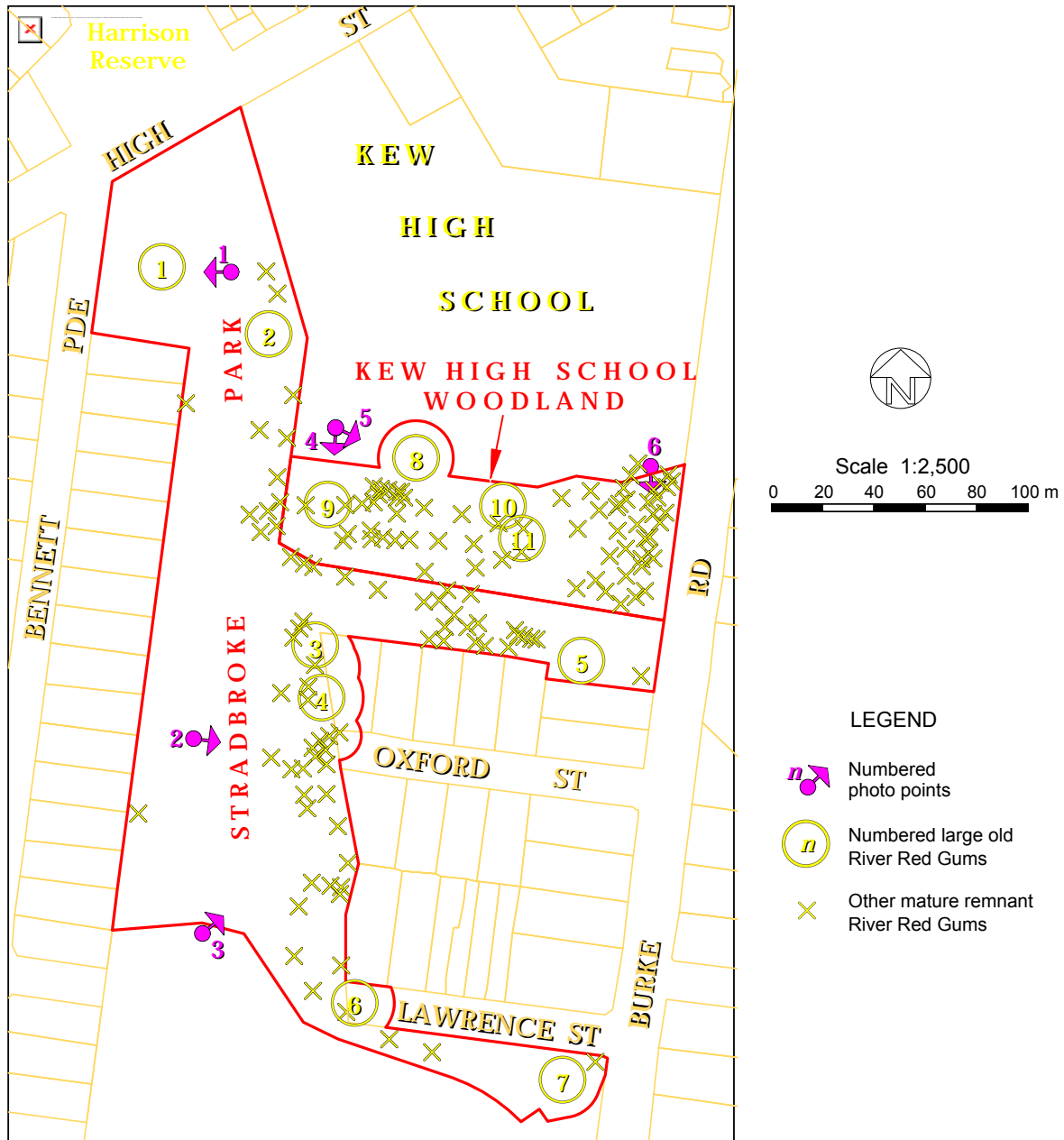
Site 33. Stradbroke Park, Kew East

A park with large old River Red Gums accompanied by extensive 'Urban forest' plantings. Melway ref. 45 K4.

Site Biological Significance Level: *Local*

Summary of the most significant natural assets:

- Seventy-nine mature River Red Gums, of which seven qualify as large old trees (centuries old in some cases);
- A resident, breeding family of the locally vulnerable Tawny Frogmouth;
- There is a fair amount of circumstantial evidence that the park is a 'stepping stone' for local movement of wildlife.



Boundaries

The aerial photograph above shows this site and Site 34 (the Kew High School woodland) both outlined in red. The boundaries of the Stradbroke Park site are property boundaries except for:

- The southern edge, which is drawn to skirt around the playground and oval; and

- Some arcs at Lawrence St and Oxford St to enclose the majority of the root systems of several large old River Red Gums. The radii of the arcs are eighteen times the trunk diameters of the associated trees, as recommended by Matheny and Clark (1998) for Tree Protection Zones around over-mature trees that are sensitive to root disturbance.

Land use & tenure

City of Boroodara park, for drainage, amenity and conservation.

Physical features

Site area: 2.77 hectares

Elevation: 21 m to 27 m

Landform: Shallow valley (formerly the course of Glass Creek, which has been replaced by a pipe).

Slope: Mostly very gentle slopes, the maximum being in the southwest with a gradient of 1:20 to the northeast.

Site area: 1.2 hectares.

Soil type: Until the twentieth century, there was a band of alluvium along the original course of Glass Creek from the dead end of Lawrence St to High St, and also along a former tributary that flowed through the arm of the reserve to the south of Kew High School. It is not known what soil was used to fill in the creeks when they were replaced by a pipe, but there is probably little of the original alluvium left at the surface. The rest of the site has shallow, light grey duplex soil.

Underlying geology: The Silurian 'Andersons Creek' formation, which is dominated by siltstone.

Site description

Stradbroke Park was included in the brief for this project only to document the size and health of individual remnant River Red Gums. However, the author found that the habitat showed sufficient promise that a full assessment of flora and fauna was conducted, including a bird survey and spotlighting.

The park includes the original courses of Glass Creek and a tributary, both of which were replaced by underground pipes in (or about) the 1960s. The only remnant indigenous flora today are approximately eighty River Red Gums (*Eucalyptus camaldulensis*), some associated Creeping Mistletoe (*Muellerina eucalyptoides*) and some scattered, hardy species of ground flora (such as occur in some suburban lawns). Some of the River Red Gums are very large specimens, several centuries old. A superb example of a very large River Red Gum is in the park's northwest, marked on the aerial photograph by a '1' within a yellow circle.

The park has a larger area of planted vegetation than remnant vegetation, forming an 'urban forest'. The plantings include indigenous species and Australian natives. Until recently, most of the plantings were trees, but indigenous understorey plants have been added in recent years.

The plantings and management of the urban forest are organised between the City of Boroodara and the Friends of Glass Creek Parklands.

The 'urban forest' plantings are reaching maturity and undergoing a natural succession, as shorter-lived trees (e.g. Black Wattle, *Acacia mearnsii*) are dying and new generations are starting to appear. Some of the planted shrub species are also proliferating naturally. As the vegetation continues to mature, it will have a natural tendency to thin out, as the larger trees draw an increasing proportion of the nutrients and moisture available in the soil.

Ecological links with other land

The site abuts woodland in the grounds of Kew High School (Site 34), which substantially augments the park's area of remnant tree cover. Downstream (north) from Stradbroke Park, there is a gap of 200 m to Hays Paddock (Site 35), which provides a similar eucalypt canopy to Stradbroke Park. The Yarra River ecological corridor lies just over the Eastern Freeway from Hays Paddock. Upstream from Stradbroke Park, there is a quite fragmented corridor of eucalypts and wattles (generally not indigenous species) planted in drainage reserves along the former course of Glass Creek.

It seems probable that some native bird species and flying insects move between these sites, particularly between Stradbroke Park and Hays Paddock. Observations of bird behaviour by David Lockwood and the author provide circumstantial evidence for such movements by the Tawny Frogmouth and the nomadic Pied Currawong.

An impediment to such movements is the absence of eucalypt canopy in Harrison Reserve, a small reserve opposite Stradbroke Park on High St.

Habitat types

The River Red Gums are almost all that remain of the park's pre-European vegetation, which would have been:

Creekline Grassy Woodland (EVC 68, endangered in the Gippsland Plain bioregion) along the creeks; and Plains Grassy Woodland (EVC 55, endangered in the Gippsland Plain bioregion) elsewhere.

Flora of special significance

Small numbers of the significant plant species below were found during the fieldwork for this study. The conservation status rating, 'vulnerable', is explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Notes
Vulnerable	<i>Juncus subsecundus</i>	Only one plant was found, within the urban forest, west of Oxford St.
Vulnerable	<i>Schoenus apogon</i>	Only three were found, near the <i>Juncus subsecundus</i> .

Full flora list

The wild plant species found in the park on 31/1/05 are listed below. In the grid squares for wild indigenous species, 'D' indicates a species that is dominant in its vegetation stratum; 'M' means that many plants were found; a tick indicates moderate numbers; and '-' means that very few plants were found.

Wild indigenous species

Austrodanthonia racemosa M
Dichondra repens -
Eucalyptus camaldulensis D
Juncus subsecundus -
Lunularia cruciata ✓

M
-
D
-
✓

Muellerina eucalyptoides M
Oxalis exilis/perennans M
Portulaca oleracea ✓
Schoenus apogon -
Senecio quadridentatus ✓

M
M
✓
-
✓

Weed species

Agrostis capillaris
Ehrharta erecta
Pitopsis undulatum
Plantago lanceolata
Polycarpon tetraphyllum

Large Old Trees

Seventy-nine remnant River Red Gums (*Eucalyptus camaldulensis*) in Stradbroke Park were mapped and (in most cases) measured and assessed during this study. Their locations are marked on the aerial photograph on page 317 and the full set of data is kept on file with the rest of this study's data.

Seven of these River Red Gums qualify as large old trees according to the Department of Sustainability & Environment's criterion for woodlands dominated by Red Gums (i.e. trunk diameters of at least 0.8 m). They are marked on the aerial photograph on page 317 with numbered yellow circles. Their characteristics are tabulated below. Only the largest of multiple trunks was measured.


Tree number:	1	2	3	4	5	6	7
Trunk diameter:	111 cm	90 cm	84 cm	90 cm	92 cm	85 cm	82 cm
Health:	Very good	Good	Very good	Good	Good	Very good	Very good

Tree number 1, which is particular significance for its size, health and attractiveness, is depicted in Photo 1 on the next page. The location and orientation of the camera are shown on the aerial photograph on page 317 by a magenta arrow accompanied by the numeral '1'.

Fauna of special significance

The significant fauna species in the list below have been observed at Stradbroke Park. The conservation status ratings, 'vulnerable' and 'occasional visitor', are explained in Section 2.5.2 (page 18). An obelisk (†) preceding the name of a species indicates that breeding was confirmed.

Conservation Status in Boroondara	Species Name	Last Record	Notes
Vulnerable	Australian Hobby	1988	One individual reported by Steve Rowe.
Vulnerable	Musk Lorikeet	2005	One flock seen; presumed seasonal visitors.
Vulnerable	Eastern Rosella	2005	At least one pair, seen on each visit.
Vulnerable	†Tawny Frogmouth	2005	At least one resident, breeding family.

Conservation Status in Boroondara	Species Name	Last Record	Notes
Occasional Visitor	Yellow Thornbill	2005	Observed by Cam Beardsell in autumn 2005.
			

Site 33, Photo 1. Large old tree number 1, a River Red Gum of great size and very good health. Note the damage-free trunk and the dense foliage in the crown, right to the ends of all branches. Mulch beneath the tree helps protect its roots. The photograph was taken on 30/9/05.

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies		Birds		White-plumed Honeyeater	1988
*Cabbage White	2005	Australian Hobby	1988	Magpie-lark	2005
Australian Painted Lady	2005	Silver Gull	2004	Willie Wagtail	1988
Common Brown	2005	†Rainbow Lorikeet	2005	Grey Butcherbird	2005
Common Grass-blue	2005	Musk Lorikeet	2005	†Australian Magpie	2005
Dingy Swallowtail	2005	Eastern Rosella	2005	Pied Currawong	2004
Yellow-banded Dart	2005	Red-rumped Parrot	1988	Little Raven	2005
		†Tawny Frogmouth	2005	Welcome Swallow	2004
Mammals		Yellow Thornbill	2005	*Common Blackbird	2005
Common Brushtail Possum	2005	†Red Wattlebird	2005	*Common Starling	2005
Common Ringtail Possum	2005	Brush Wattlebird	1988	*Common Myna	2005
Unidentified microbat	2005	†Noisy Miner	2005		

Bird census

David Lockwood carried out a twenty-minute bird census in the vicinity of Burke Rd, Kew, on 24th October 2004, as part of his bird survey of this site. He recorded nine native species and one introduced species. The species with the highest counts were Noisy Miner (16), Red Wattlebird (13) and Little Raven (4). These figures indicate a suburban bird population that is well out of ecological balance. This imbalance is undoubtedly resulting in poorer health of indigenous trees (and probably many of the non-indigenous trees), and is attributable to the structure and composition of vegetation in the urban forest.

Fauna habitat

Flowering non-indigenous eucalypts such as ironbarks provide a copious nectar source for the Red Wattlebirds, Noisy Miners and at least two species of lorikeet, as well as for insects. The Red Wattlebirds and Noisy Miners are in such numbers as to displace most smaller native birds.

Various nests and possum dreys were observed in the branches of River Red Gums. There are few tree hollows. A colony of insectivorous bats therefore roosts in the picnic shelter roof rather than in hollows.

Mown grassy areas are frequented by the Eastern Rosella, Red-rumped Parrot and Common Grass Blue butterflies.

The lack of broad areas of shrubs means that small insectivorous birds have little chance of persisting here.

The park appears (without any formal survey) to have a quite rich insect fauna.

Site significance ratings

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.2.6 attributes **Local** significance to links of local-scale ecological corridors, for which there is some evidence at this site.

Regionally threatened Ecological Vegetation Class

The site's two original EVCs are now endangered, but they are represented by such heavily modified vegetation that the BioSites criteria for threatened EVCs are not met.

Rare or threatened plants

The site's significant plant species do not have viable populations.

Rare or threatened fauna

The presence of a resident family of the locally vulnerable Tawny Frogmouth, which has bred near the park's Oxford St entrance in successive years, represents **Local** significance according to BioSites criterion 3.1.5. It also seems likely that the pair of Eastern Rosellas seen repeatedly in the park are resident and part of a viable population (in conjunction with the rest of the Glass Creek corridor), which would also attribute local significance to the park.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Panic Veldt-grass (<i>Ehrharta erecta</i>); • Moderately serious: Brown-top Bent (<i>Agrostis capillaris</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Ribwort (<i>Plantago lanceolata</i>), Four-leafed Allseed (<i>Polycarpon tetraphyllum</i>). 	All	Moderate	Current
Precariously small populations of <i>Juncus subsecundus</i> , <i>Schoenus apogon</i> and <i>Dichondra repens</i> , making them vulnerable to inbreeding or other threats.	Significant flora	Moderate	Current
Predation of birds by foxes and cats.	Birds	Low to Moderate	Current
Eucalypt dieback disease due to psyllids (currently) or other causes.	Trees; bird habitat	Low	Current

Priority actions

- Use grass-specific herbicide to control the densest infestations of Panic Veldt-grass (*Ehrharta erecta*), which the park's hand-weeders are unable to bring under control. A line trimmer can also be helpful to reduce the seed production by this species.

Past management and revegetation

See the section headed 'site description' on page 318.

Future revegetation and vegetation management

The availability of nutrients and moisture in the soil will not allow the present density of trees to persist indefinitely. The weaker trees are dying as they are out-competed by others. As the vegetation matures further, more of the trees must die so that others may grow.

It may be preferable to control which species survive by thinning out other species. If enough trees are thinned, there will be an opportunity to plant more shrub species. Broadening the area of shrubs would improve the habitat for small insect-eating birds such as the White-browed Scrubwren, and hence improve the health of the vegetation by keeping insect pests under better control. However, dense shrubs in other parks have sometimes prompted concern in people who regard shrubs as providing a screen for criminals, particularly in proximity to a school.

Although there is some natural regeneration of species in the urban forest, the Friends of Glass Creek Parklands are concerned that there has been too little soil disturbance to stimulate more regeneration. They advise that some new beds are being established for encouraging natural regeneration. This should be accompanied by a commitment that weeds will be removed frequently, because soil disturbance will stimulate germination of weeds as much as (or more than) desirable species. In addition, regeneration should only be actively encouraged where the regenerating plants have a good chance of surviving to maturity rather than dying from being out-competed for light, moisture and nutrients by the established trees.

Monitoring

The following items have been gathered to provide a baseline for future monitoring:

- The plant list, as presented beneath the heading 'Full flora list' above. Repeat every four years or so. Check for loss or decline of indigenous species and changes in the seriousness of each weed species;
- Records of the trunk diameter and health of all large old River Red Gums and most of the seventy or so smaller River Red Gums. The health ratings of the large old trees should be checked every two years, with a view to taking action (e.g. watering or pest control) if significant decline is noticed;
- Population sizes of the indigenous plant species listed in the section headed 'Flora of special significance', and of *Dichondra repens* (of which there are only two plants - one beneath the large old River Red Gum at the dead end of Lawrence St, and the other near the fence that divides 56 and 58 Bennett Pde). Check the populations every two to four years;
- The fauna list and bird survey, including a twenty-minute bird census. Repeat in spring every four to eight years. Check for changes in the abundance of birds (particularly aggressive honeyeaters), the particular species present and the species that are breeding. This task should ideally be repeated every two to four years.
- The monitoring photographs displayed below, with locations and orientations shown on the aerial photograph on page 317. Original digital images are available separately. Repeat the photographs about every two years, checking for weed growth and the features mentioned in the captions.

Monitoring photographs, taken on 31st January 2005.

The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 317.



Site 33, Photo 2. A view toward a prominent Spotted Gum from the middle of the main footpath, to show the stage of growth of the urban forest trees and the very sparse understorey in the foreground and middle distance.



Site 33, Photo 3. A view from next to a see-saw and Silky Oak, to show the dying *Acacia mearnsii* trees and the current density of the urban forest vegetation.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of 5 hours and 10 minutes (including a walk with the Friends of Glass Creek Parklands) on 31st January 2005, using this study's standard approach described in Section 2.3. This included:
 - Compilation of a list of all wild introduced and indigenous plant species, including a measure of the abundance of each indigenous species and the threat level of each weed species;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Spotlighting by the author for thirty minutes on the night of 31st January 2005;
- A daytime bird survey of the site by David Lockwood on 24/10/04 according to the protocol discussed in Section 2.4.1, including a twenty-minute bird census;
- A neighbour's report of observing Tawny Frogmouths' nesting success in successive years up to 2004;
- Aerial photography from August 2004;
- Fauna records from ecologist Cam Beardsell and the Atlas of Victorian Wildlife (which includes data from Steve Rowe);
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

It would be desirable to have a bat expert identify the bats living in the roof of the picnic shelter, and assess their conservation significance. There are also other recommendations for further investigations in the section headed 'Monitoring' above.

Acknowledgment

Thanks to members of the Friends of Glass Creek Parklands, who gave the author a tour and some documentation about the park, its history and landscape context.

Site 34. Kew High School Woodland

River Red Gum woodland in the southern part of the school ground. Melway ref. 45 K3.

Site Biological Significance Level: *Local*

Summary of the most significant natural assets:

- A full canopy of remnant River Red Gums, four of which are large old trees in good to very good health;
- There is a fair amount of circumstantial evidence that the woodland and adjacent park represent a 'stepping stone' for local movement of wildlife.

Aerial photograph

See page 317, which also covers Stradbroke Park.

Boundaries

This site is labelled and outlined in red on the aerial photograph on page 317. The boundaries to the west, south and east coincide with the school fence. Most of the northern boundary has been drawn with somewhat arbitrary straight lines positioned to enclose all of the patch of mature eucalypts. The exception is an arc of radius of 14.6 m centred on the trunk of the large River Red Gum labelled '8' on the aerial photograph. This radius is eighteen times the trunk diameter of that tree, corresponding to the Tree Protection Zone recommended by Matheny and Clark (1998) for over-mature trees of species that are sensitive to root disturbance.

Land use & tenure

Grounds of a government secondary school.

Physical features

Site area: 0.735 hectares

Elevation: 22 m to 24 m

Slope: Slight, typically 1:30.

Landform: Valley floor, beside the confluence of the former courses of Glass Creek and a minor tributary.

Soil type: Shallow, light grey duplex soil, at least in the north. There would once have been shallow alluvium close to the southern and western school fences, but it is not known how much the alluvium was disrupted when the creeks were filled in.

Underlying geology: The bedrock is Silurian sedimentary rock of the 'Andersons Creek' formation, which is dominated by siltstone.

Site description

This section of the school grounds contains seventy-one naturally occurring River Red Gums (*Eucalyptus camaldulensis*) with trunk diameters exceeding 10 cm, as well as some smaller saplings of the same species. Some of the River Red Gums support the indigenous Creeping Mistletoe, *Muellerina eucalyptoides*. There is no more native understorey than one might find in a suburban garden. There are a few ornamental plantings, such as Cherry-plum (*Prunus cerasifera*), among the River Red Gums.

The seventy-one mature River Red Gums were all mapped, measured and their health assessed. Their locations are marked on the aerial photograph on page 317 and the full set of data is kept on file with the rest of this study's data.

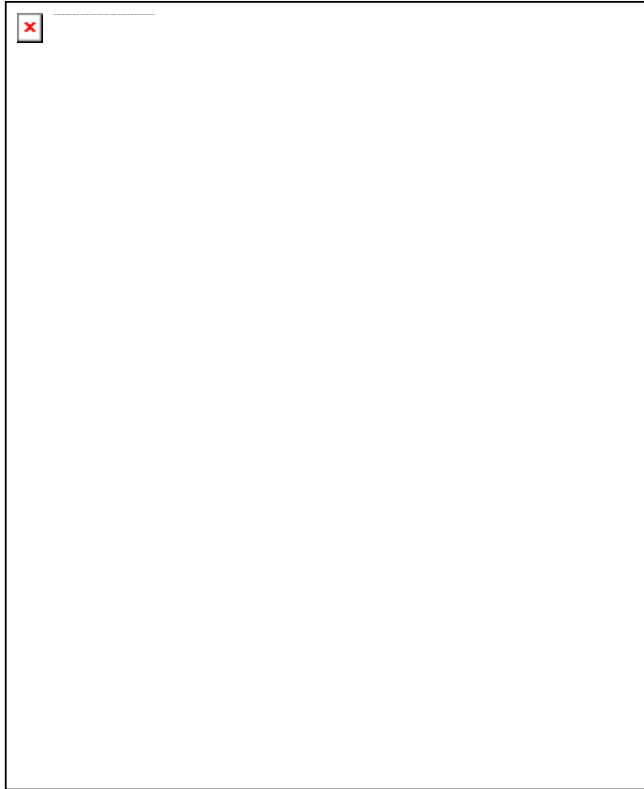
Four of these River Red Gums qualify as large old trees according to the Department of Sustainability & Environment's criterion for woodlands dominated by Red Gums (i.e. trunk diameters of at least 0.8 m). They are marked on the aerial photograph on page 317 with yellow circles numbered 8 to 11 (numbers 1 to 7 being in Stradbroke Park). Their characteristics are tabulated below. Only the largest of multiple trunks was measured.

Tree number:	8	9	10	11
Trunk diameter:	81 cm	87 cm	86 cm	81 cm
Health:	Very good	Good	Good	Very good

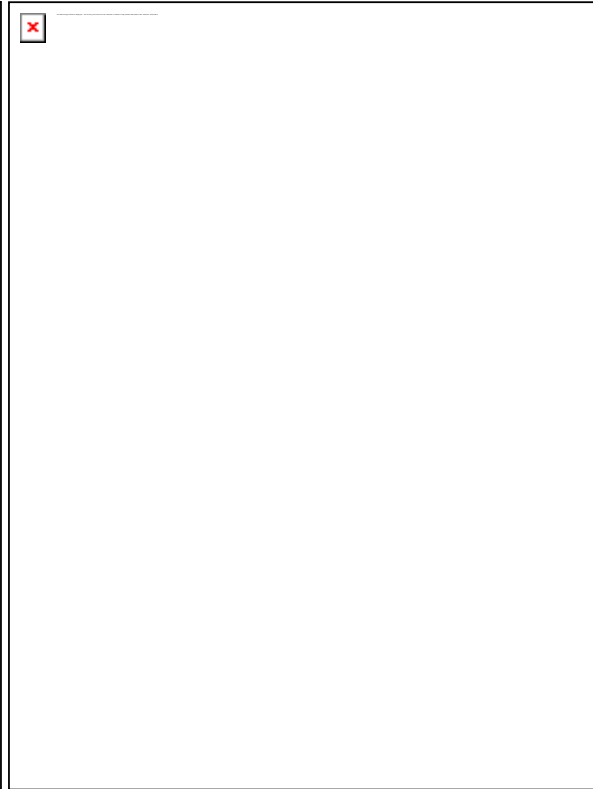
The health rating statistics for all seventy-one River Red Gums with trunk diameters exceeding 10 cm are as follows:

Health Rating:	Very Good	Good	Fair to good	Fair	Fair to poor	Poor
Number of trees:	3	13	13	14	12	16

The three photographs below, taken on 27th September 2005, are for monitoring the health of the trees. The locations and orientations of the photographs are marked on the aerial photograph on page 317.

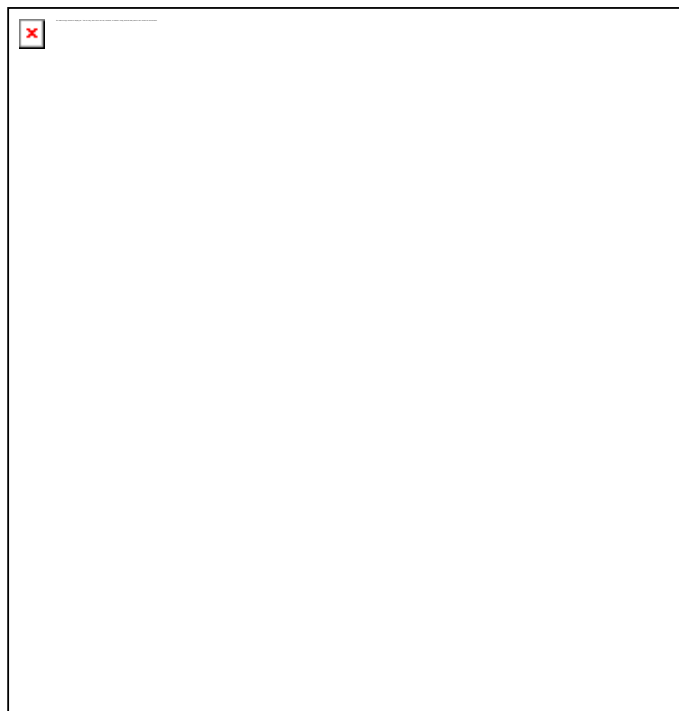


Site 34, Photo Point 4. The purpose of this photograph is for monitoring large old tree number 9 (in the centre) and the condition of foliage in the canopy of trees generally.



Site 34, Photo Point 6. Burke Rd is visible at left. Note the bare ground, high density of trees and dead foliage on some trees.

Site 34, Photo Point 5. The purpose of this photograph is for monitoring large old tree number 8 (the main subject) and the condition of foliage in the canopy of trees generally.



All but one of the trees in poor health are east of large old tree number 11 (i.e. close to Burke Rd), and most of the trees in fair to poor health are in the same area. Only two trees in that area are in good health, and none of them are in very good health. The photograph from Photo Point 6 that appears on the previous page depicts the poor condition of many trees in this area.

Factors contributing to the poorer health of trees near Burke Rd compared with the rest of the site include the high tree density, soil compaction and insect damage. The trees are too close together for them to all survive to old age, so some of the ill-health may be due to a natural process of thinning out. Within the site generally, the older, sparser trees tend to be in better health than younger, denser ones.

Ecological links with other land

The mature trees in the school grounds substantially augment Stradbroke Park's habitat for birds and flying insects. The ecological links with other land are the same as for Stradbroke Park – see page 318.

Habitat types

The River Red Gums are practically all that remain of the school's pre-European vegetation, which would have been:

Creepline Grassy Woodland (EVC 68, endangered in the Gippsland Plain bioregion) along the southern and western fences; and

Plains Grassy Woodland (EVC 55, endangered in the Gippsland Plain bioregion) in other areas.

Site significance ratings

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.2.6 attributes **Local** significance to links of local-scale ecological corridors, for which there is some evidence at this site (as part of a larger area of tree cover, in combination with Stradbroke Park).

Regionally threatened Ecological Vegetation Class

The site's two original EVCs are now endangered, but they are represented by such heavily modified vegetation that the BioSites criteria for threatened EVCs are not met.

Threats

The following threat to the site's ecological values is presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Eucalypt dieback due to soil compaction or insect attack.	Trees	Low to Moderate	Current

Recommendation

Because of the dieback of many trees east of large old tree number 11, it would be desirable to obtain the advice of an arborist who specialises in eucalypts to examine the causes and possible solutions. Two of the corrective options that may be considered are soil aeration and/or laying a groundcover such as mulch or geotextile that protects roots and provides a better surface for the school's students than the existing bare earth. The Planning Scheme may prevent thinning the trees.

Information sources used in this assessment

- Site inspections on 31st January and 27th September 2005 according to the standard approach described in Section 2.3.5, including a search for native vegetation, then mapping, measuring and photographing the trees and assessing their health;
- Spotlighting of the trees (from within Stradbroke Park) by the author on the night of 31st January 2005;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Acknowledgment

Thanks to Kew High School for granting permission to inspect the River Red Gums.

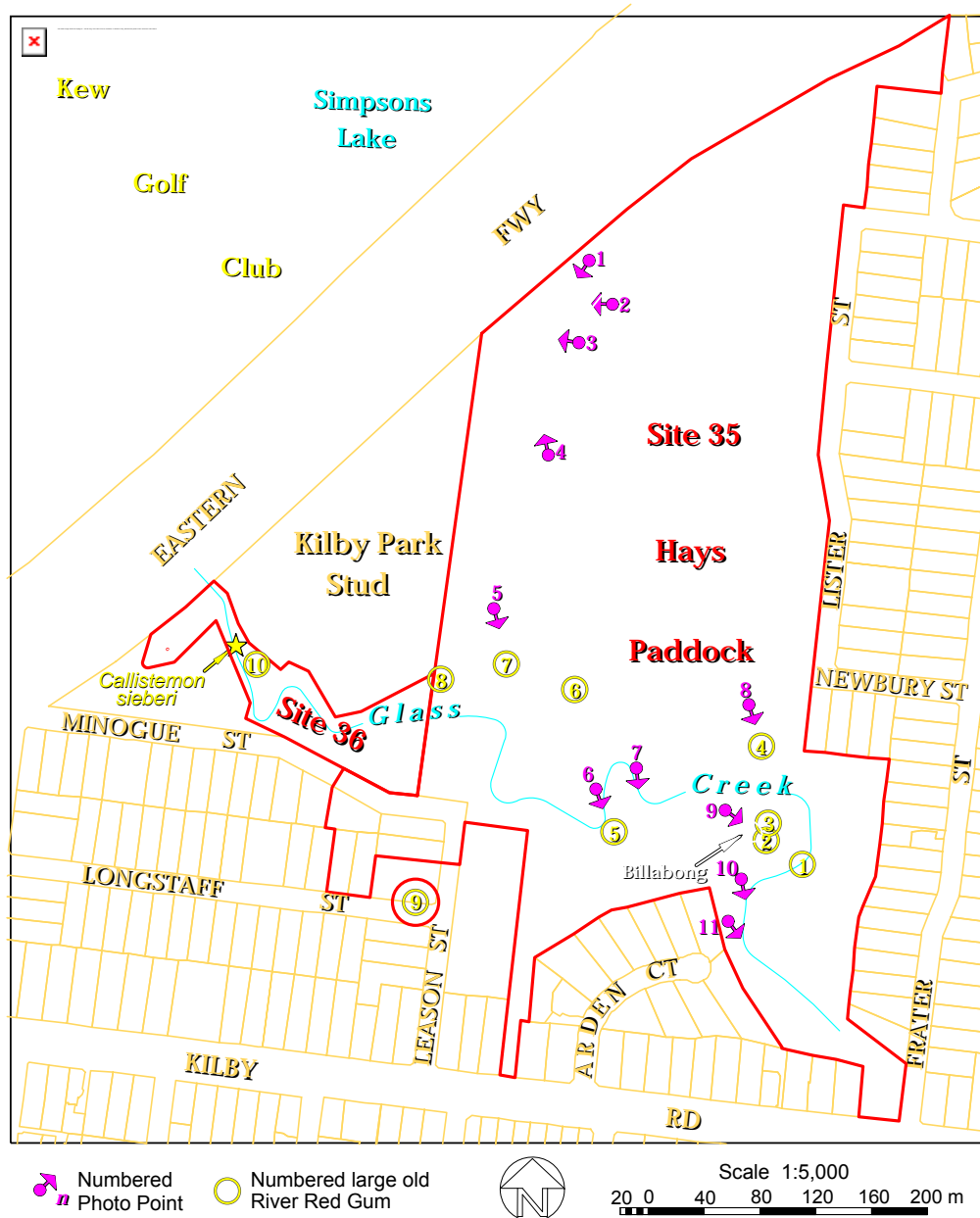
Site 35. Hays Paddock, Kew East

Public parkland on Glass Creek at the edge of the Yarra floodplain, with woodland and billabongs. Melway ref. 45 J1.

Site Biological Significance Level: *State*

Summary of significant natural assets:

- The Hays Paddock pond includes high-quality vegetation belonging to the endangered Ecological Vegetation Class, Floodplain Wetland Complex;
- The other Ecological Vegetation Class present is Floodplain Riparian Woodland, which is also endangered;
- There are viable populations of many species of flora and fauna that are threatened in Boroondara or Melbourne;
- The site is on the edge of the major ecological corridor along the Yarra River, at the junction with the Glass Creek corridor.



Boundaries

The site includes the whole of the contiguous public land at Hays Paddock, as defined by the 'Public Park and Recreation Zone' in the Boroondara Planning Scheme. It also includes a circle around a tree beside Longstaff St near the park

entrance. The boundaries are outlined in red on the aerial photograph, as well as for the adjoining Site 36. The radius of the circle around the tree has a radius of 16.6 m from the trunk. This is eighteen times the trunk diameter, corresponding to the Tree Protection Zone recommended by Matheny and Clark (1998) for over-mature trees that are sensitive to root disturbance.

Land use & tenure: Parkland belonging to the City of Boroondara, for recreation, drainage purposes and nature conservation. The facilities include ovals, a sports pavilion, a regional playground and a bird hide.

Physical features

Site area: 15.8 hectares

Elevation: Most of the site is on the Yarra River floodplain at elevations of 14-17 m. Glass Creek has a channel 3m below the floodplain. The southeast corner abuts Kilby Rd, which has been built up to an elevation of 20 m.

Slope: Aside from the banks of Glass Creek and the billabongs, the site has very gentle gradients.

Landform: Floodplain, riverbank and billabongs.

Soil type: Alluvium, which is loose and sandy next to Glass Creek and has a clay component further from the creek.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek formation, which is dominated by siltstone.

Site description

The pond at Hays Paddock is the most ecologically intact wetland in Boroondara. Considering that wetlands represent regionally endangered ecosystem types, this billabong is one of the most biologically significant sites in Boroondara.

Photographs 1-4 on page 337 depict the Hays Paddock pond.

Prior to the construction of the Eastern Freeway in the 1970s, the pond was once part of Simpsons Lake at Kew Golf Club (see the aerial photograph). Shortly following the freeway construction, the pond was enlarged and some of the edge was given a very gentle slope to provide optimal habitat for native wetland flora, frogs and invertebrates. The pond was left to revegetate naturally (according to landscape architect Mark McWha, who was intimately involved with the work).

Quadrat data from 1990 shows that the pond's vegetation had regenerated fairly well by that time. Since then, numerous additional species have established, particularly the floating plants that characterise the endangered 'Billabong Wetland' vegetation community. It is common for wetland plants to colonise ponds fairly rapidly through introduction by waterbirds.

The pond rarely runs dry, if ever. It is an important attraction for visitors to the park. There is a bird hide at the southern end of the pond, accessible through the adjacent playground.

There is another, smaller wetland in the park's south, next to Glass Creek. It is marked on the aerial photograph and depicted in Photo 9 on page 339. This billabong dries up occasionally. It has very little indigenous vegetation (being overrun by Kikuyu), but it still supports abundant native frogs. It could be fairly readily rehabilitated and it has wonderful potential for a second highly significant wetland within the site.

Glass Creek is a highly modified waterway, having been replaced by a pipe upstream of Hays Paddock. It is also subject to water pollution. Nevertheless, native migratory fish (including the locally vulnerable Broadfin Galaxias) still swim into Hays Paddock from further downstream.

Some very large River Red Gums (*Eucalyptus camaldulensis*) give the park additional habitat value, as well as contributing substantially to the park's visual amenity and historical attraction.

Much of the banks of Glass Creek have quite bad infestations of woody weeds. However, these weeds are being progressively replaced with indigenous revegetation. This is a slow process, thereby avoiding the adverse affects of suddenly removing all the woody weeds and hence all the habitat for shrub-dependent fauna.

Apart from the creek banks, there has been extensive revegetation of the park over about two decades. Earlier plantings were of Australian native trees, and have contributed to an abundance of the aggressive native birds, Red Wattlebird, Noisy Miner and Rainbow Lorikeet, as well as the introduced Common Myna. More recent revegetation has included a shrub layer and been restricted to plants indigenous to Boroondara (although some do not occur naturally on floodplains). The more recent plantings are providing better habitat for smaller native birds.

Ecological links with other land

This site is separated from the Yarra River ecological corridor only by the Eastern Freeway, with Simpsons Lake at Kew Golf Club (Site 7, page 107) directly over the freeway. The Australian Dart and Nankeen Night Heron were both observed traversing the freeway between Simpsons Lake and the pond at Hays Paddock, and these species have also been

observed moving along the Yarra River corridor. For these species, the Hays Paddock pond represents an extension of the habitat at Kew Golf Club and the rest of the Yarra River corridor. It seems extremely likely that many other species of waterbird found at Hays Paddock undertake similar movements between Hays Paddock and the Yarra River corridor.

Glass Creek demonstrably functions as a corridor for migration of native fish, including the locally vulnerable migratory species, Broadfin Galaxias (*Galaxias brevipinnis*), which have been repeatedly found at Hays Paddock.

Habitat types

Water Body (No EVC number). The Hays Paddock pond provides open water habitat for frogs, ducks and other aquatic life. The billabong in the south also provides open water habitat, intermittently.

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion). Mostly represented by scattered trees and small patches of native understorey beside Glass Creek. Sixteen wild indigenous plant species were found.

Canopy trees: A pure stand of *Eucalyptus camaldulensis*.

Lower trees: Naturally occurring plants of *Acacia melanoxylon*, *Acacia mearnsii*, *Acacia melanoxylon* and *Melaleuca ericifolia* are scattered along Glass Creek.

Shrubs: There are no remnants of the pre-European shrubs. However, shrub weeds are abundant in places. Revegetation is redressing the absence of remnant shrubs.

Vines and ferns: There are no indigenous vines or ferns.

Ground flora: The only remnant ground flora species present in reasonable numbers are the hardy species, *Austrodanthonia racemosa*, *Lythrum hyssopifolia* and *Persicaria decipiens* (the latter two confined to the edge of the water of Glass Creek).

Floodplain Wetland Complex (EVC 172, **regionally Endangered**), incorporating Billabong Wetland

Represented by the pond, occupying 0.6 ha and comprising 25 indigenous plant species.

Woody plants: Confined to a few young *Eucalyptus camaldulensis* at the edge.

Dominant species: Dominated by floating species that varied during the course of this study. *Ricciocarpos natans* was dominant in spring 2004, accompanied by extensive *Azolla filiculoides*. *Lemna disperma* became co-dominant through summer and *Wolffia australiana* became numerous. The more persistent species that are abundant are *Alternanthera denticulata*, *Eleocharis acuta*, *Eleocharis sphacelata*, *Juncus amabilis*, *Lythrum hyssopifolia*, *Persicaria decipiens*, *Triglochin procera* and *Typha domingensis*. Less abundant characteristic species include *Alisma plantago-aquatica*, *Myriophyllum crispatum* and Boroondara's only population of *Neopaxia australasica*.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Last Record	Notes
Melbourne	Boroondara			
Rare or threatened	Critically Endangered	<i>Juncus australis</i>	2005	A few beside Glass Creek and the pond.
Rare or threatened	Critically Endangered	<i>Neopaxia australasica</i>	2005	The only population in Boroondara. ¼ m ² at MGA coordinates 328959, 5815956; c. 3m ² at 329018, 5815985; a few near 329015, 5815980.
Rare or threatened	Endangered	<i>Euchiton sphaericus</i>	1990	Moderately common in 1990. Likely to return.
Rare or threatened	Endangered	<i>Myriophyllum crispatum</i>	2005	Moderately common at the pond.
Rare or threatened	Vulnerable	<i>Ricciocarpos natans</i>	2005	Smothering the pond in spring 2004.
Rare or threatened	Secure	<i>Wolffia australiana</i>	2005	Abundant on the pond.
	Endangered	<i>Eleocharis acuta</i>	2005	Fairly abundant around the pond.
	Endangered	<i>Glyceria australis</i>	2005	Scattered around the pond.
	Vulnerable	<i>Juncus pauciflorus</i>	2005	Scattered around the pond.
	Vulnerable	<i>Typha domingensis</i>	2005	Abundant at the pond.
	Vulnerable	<i>Amyema quandang</i>	2005	Several on <i>Acacia mearnsii</i> near the pavilion.

Full flora list

The species recorded from Hays Paddock are listed below. An asterisk indicates species recorded in a 1990 quadrat and all other species were recorded by the author during this study. The numbered columns correspond to the following areas:

1 = At the main (northern) billabong;
2 = In or next to the creek water (roots normally saturated);

3 = On the creek banks (roots not normally saturated);
4 = On the floodplain.

In the grid squares:

D = the species is dominant in its vegetation stratum;
M = many plants;

✓ = moderate numbers; and
- = very few plants.

Species Name	- Area -				Species Name	- Area -				Species Name	- Area -			
	1	2	3	4		1	2	3	4		1	2	3	4
Wild indigenous species					<i>Portulaca oleracea</i>		M	M	✓	<i>Ehrharta longiflora</i>			✓	
<i>Acacia dealbata</i>			✓		<i>Ricciocarpos natans</i>	D				<i>Foeniculum vulgare</i>			✓	
<i>Acacia mearnsii</i>			✓		<i>Triglochin procera</i>	M				<i>Fraxinus angustifolia</i>			✓	
<i>Acacia melanoxylon</i>			✓		<i>Typha domingensis</i>	D	-			<i>Fumaria</i> sp.			✓	
<i>Alternanthera denticulata</i>	M				<i>Wolffia australiana</i>	M				<i>Galenia pubescens</i>			✓	✓
<i>Amyema quandang</i>				✓	Planted indigenous species					<i>Galium aparine</i>			✓	
<i>Austroanthonia racemosa</i>			✓	✓	<i>Acacia verticillata</i>	-				<i>Helminthotheca echioides</i>	✓			
<i>Azolla filiculoides</i>	✓				<i>Acaena novae-zelandiae</i>	✓				<i>Lepidium didymum</i> *	-			
<i>Eleocharis acuta</i>	✓				<i>Banksia marginata</i>				-	<i>Ligustrum lucidum</i>			✓	
<i>Eleocharis sphacelata</i>	M				<i>Carex appressa</i>	✓				<i>Lycium ferocissimum</i>			✓	
<i>Epilobium hirtigerum</i>	✓		✓		<i>Carex appressa</i>	✓				<i>Malva</i> sp.*	-			
<i>Eucalyptus camaldulensis</i>	✓		D	D	<i>Dianella longifolia</i> s.l.	✓				<i>Modiola caroliniana</i> *	-			
<i>Euchiton sphaericus</i> *	✓				<i>Melicytus dentatus</i>	✓				<i>Paspalum distichum</i>	M	✓		
<i>Glyceria australis</i>	✓				<i>Poa labillardierei</i>	✓				<i>Pennisetum clandestinum</i>			D	
<i>Juncus amabilis</i>	✓				Weed species					<i>Phalaris aquatica</i>			✓	
<i>Juncus ?australis</i>				-	<i>Acacia baileyana</i>				-	<i>Plantago major</i>	✓			
<i>Juncus australis</i>	-				<i>Acer negundo</i>				✓	<i>Poa annua</i> *	✓			
<i>Juncus bufonius</i>	✓		✓		<i>Alisma lanceolata</i>	-				<i>Populus alba</i>			✓	
<i>Juncus gregiflorus</i>	✓				<i>Araujia sericifera</i>				✓	<i>Quercus robur</i>			-	
<i>Juncus pauciflorus</i>	✓				<i>Aster subulatus</i>	✓			✓	<i>Ranunculus repens</i>	✓	✓	✓	
<i>Juncus sarophorus</i>	-				<i>Callitriche stagnalis</i> *	✓				<i>Ricinus communis</i>			✓	
<i>Lachnagrostis filiformis</i>	✓				<i>Cirsium vulgare</i> *	-				<i>Rorippa palustris</i>	✓			
<i>Lemna disperma</i>	D				<i>Conyza sumatrensis</i>				✓	<i>Rubus ?anglocandicans</i>	✓		✓	
<i>Lythrum hyssopifolia</i>	MM				<i>Coprosma repens</i>				-	<i>Rumex ?conglomeratus</i>	✓			
<i>Melaleuca ericifolia</i>	✓		✓		<i>Cynodon dactylon</i> *	✓				<i>Salix babylonica</i> s.l.*	-			
<i>Muellerina eucalyptoides</i>				M	<i>Cyperus eragrostis</i>	✓	✓			<i>Salix</i> sp.			✓	
<i>Myriophyllum crispatum</i>	✓				<i>Dactylis glomerata</i>				✓	<i>Solanum mauritanium</i>			M	
<i>Neopaxia australasica</i>	✓				<i>Datura ?stramonium</i>				-	<i>Solanum nigrum</i>	✓			
<i>Oxalis ?exilis/perennans</i>	✓				<i>Ehrharta erecta</i>				✓	<i>Tradescantia fluminensis</i>			M	
<i>Persicaria decipiens</i>	MM									<i>Tropaeolum majus</i>			✓	
<i>Persicaria lapathifolia</i>			✓							<i>Verbena</i> sp.	✓			

Large old trees

Eight River Red Gums (*Eucalyptus camaldulensis*) at Hays Paddock, and one beside Longstaff St, were found to qualify as large old trees according to the Department of Sustainability & Environment's criterion for Floodplain Riparian Woodland (i.e. trunk diameters of at least 0.8 m). These are each circled in yellow and numbered on the aerial photograph page 328. Their characteristics are tabulated below. Only the largest of multiple trunks was measured.

Tree number:	1	2	3	4	5	6	7	8	9
Trunk diameter:	81 cm	83 cm	89 cm	130 cm	131 cm	121 cm	132 cm	129 cm	92 cm
Health:	Fair	Good	Good	Good	Good	Fair	Very good	Good	Very good

Trees 6 and 8 have clearly visible hollows that would suit occupation by hollow-dependent native fauna. There may be hollows in some of the others, too hard to detect from the ground.

Tree 6 is suffering from supporting too many Creeping Mistletoe (*Muellerina eucalyptoides*) plants.

Fauna of special significance

The significant fauna species in the list below have been observed at Hays Paddock. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status			Species Name	Last Record	Notes
Victoria	Melbourne	Boroondara			
Vulnerable	Secure	Occasional Visitor	Great Egret	1988	Observed by Steve Rowe.
Near Threatened	Secure	Endangered	Nankeen Night Heron	2005	A frequent visitor.
	Vulnerable	Vulnerable	Broadfin Galaxias	2002	Found in successive surveys.
	Vulnerable	Vulnerable	Crested Pigeon	2004	A regular visitor.
	Rare	Endangered	Darter	2004	Frequency of visits unclear.
	Rare	Occasional Visitor	Great Crested Grebe	1988	Observed by Steve Rowe.
		Endangered	Striped Marsh Frog	2004	Approximately 10 males heard.
		Endangered	Spotted Marsh Frog	2004	>100 males heard.
		Endangered	Southern Brown Tree Frog	2004	<10 males heard.
		Endangered	Spotted Pardalote	1988	Probably still visits.
		Endangered	Yellow-rumped Thornbill	1988	Probably still visits.
		Endangered	Little Grassbird	1988	Observed by Steve Rowe.
		Vulnerable	Little Pied Cormorant	2005	Probably a regular visitor.
		Vulnerable	Little Black Cormorant	2005	Frequency of visits unclear.
		Vulnerable	White-faced Heron	2004	Probably a regular visitor.
		Vulnerable	Musk Lorikeet	2004	A seasonal visitor.
		Vulnerable	Little Lorikeet	2004	A seasonal visitor.
		Vulnerable	Eastern Rosella	2004	Resident and breeding.
		Vulnerable	White-browed Scrubwren	2005	Resident or regular visitor.
		Vulnerable	Grey Shrike-thrush	1988	Visits would be very rare now.
		Occasional Visitor	Australasian Grebe	1988	May still visit occasionally.
		Occasional Visitor	White-necked Heron	2005	Reported by E. Xipell; rare.
		Occasional Visitor	Cattle Egret	1983	Reported by Fred T.H Smith.
		Occasional Visitor	Gang-gang Cockatoo	2004	Reported by E. Xipell.

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies					*Rock Dove	2005
*Cabbage White	2005		Mammals		*Spotted Turtle-Dove	2005
Common Brown	2005		Common Brushtail Possum	2004	Crested Pigeon	2004
Common Grass-blue	2005		Common Ringtail Possum	2004	Gang-gang Cockatoo	2004
					Galah	2004
Fish			Birds		Long-billed Corella	2005
Broadfin Galaxias	2002		Australian Wood Duck	2005	Sulphur-crested Cockatoo	2005
*Goldfish	1989		*Mallard	1988	Rainbow Lorikeet	2004
Shortfin Eel	1992		†Pacific Black Duck	2005	Musk Lorikeet	2004
*Oriental Weatherloach	1992		Chestnut Teal	2005	Little Lorikeet	2004
*Mosquitofish	2005		Australasian Grebe	1988	†Eastern Rosella	2004
			Great Crested Grebe	1988	Red-rumped Parrot	2005
Reptiles			Darter	2004	Spotted Pardalote	1988
Tiger Snake	2003		Little Pied Cormorant	2005	White-browed Scrubwren	2005
			Little Black Cormorant	2005	Brown Thornbill	2004
Frogs			White-faced Heron	2004	Yellow-rumped Thornbill	1988
Common Froglet	2004		White-necked Heron	2005	Red Wattlebird	2004
Striped Marsh Frog	2004		Great Egret	1988	Brush Wattlebird	2005
Spotted Marsh Frog SCR	2004		Cattle Egret	1983	†Noisy Miner	2005
Southern Brown Tree Frog	2004		Nankeen Night Heron	2005	White-plumed Honeyeater	2004
*Eastern Dwarf Tree Frog	2005		Australian White Ibis	1988	Grey Shrike-thrush	1988
			Purple Swamphen	2005	†Magpie-lark	2005
			†Dusky Moorhen	2005	Willie Wagtail	2005
			Eurasian Coot	2005	†Grey Butcherbird	2005
			Silver Gull	2005	Australian Magpie	2005

Pied Currawong	2005	Welcome Swallow	2004	*Common Starling	2005
Little Raven	2005	Little Grassbird	1988	*Common Myna	2005
*House Sparrow	1988	*Common Blackbird	2005		

Bird census results

One twenty-minute bird census was carried out as part of the bird survey by David Lockwood on 18/10/04. He recorded fifteen native species and five introduced species. The species with the highest counts were Rock Dove (12) and six each of Dusky Moorhen, Wood Duck, Pacific Black Duck, Red Wattlebird and Common Myna. The number of species was high by Boroondara's standards, attributable to the variety of habitats provide by wetlands, woodland and playing fields.

Fauna habitat

Despite periodic odorous and cloudy water pollution, Glass Creek is still found to support the locally vulnerable migratory fish, Broadfin Galaxias, as well as the Shortfin Eel.

The vegetation and water body of the pond provide excellent wetland habitat and are well used by waterbirds, frogs and probably aquatic invertebrates. The northwestern edge of the billabong is sufficiently secluded for the Nankeen Night-heron and Brown Thornbill to regularly visit, but waterbirds' usage of most of the billabong is undoubtedly diminished by the number of visitors and particularly the practice of allowing (and even encouraging) dogs to swim there.

Dogs swimming in the pond represent the greatest threat or adverse impact on the site's high value for wildlife.

The presence of the introduced Eastern Dwarf Tree Frog is probably a significant threat to indigenous frogs in the pond.

The minor billabong beside Glass Creek in the park's south had water in it during the visits of this study. This billabong carries large numbers of several native frog species, including by far the largest population of Spotted Marsh Frogs found during the present study. This billabong was also seen occupied by a family of Chestnut Teal on several occasions that the author visited. This billabong's habitat values are improved significantly by being more secluded from people and dogs than the pond to its north. It appears that the billabong could make excellent wetland habitat for fauna if the Kikuyu which dominates it were to be controlled.

Away from the billabongs, profusely-flowering eucalypts such as the planted ironbarks were seen to attract large numbers of Red Wattlebirds and Rainbow Lorikeets. These species are aggressive toward smaller insect-eating birds, and the displacement of those smaller birds may be adversely affecting the health of some of the site's eucalypts.

Noisy Miners are similarly aggressive to the Red Wattlebird, and were observed mobbing an Eastern Rosella feeding on Cape Weed (*Arctotheca calendula*) flower buds or seeds. Fledgling young Noisy Miners were also observed.

At least two of the River Red Gums contain hollows of various sizes. The introduced Common Myna was seen to investigate these, possibly for nesting sites. A nesting Magpie-lark was found in one of the River Red Gums and a nesting Grey Butcherbird in a smaller planted eucalypt.

Two Common Ringtail Possum dreys were found in separate planted Melaleucas.

Site significance ratings

This site is part of the Department of Sustainability & Environment's BioSite number 5063, which extends along the Yarra River from Burke Rd to Chandler Hwy, on both sides of the river. The significance level given in the BioSites database is 'Regional', but this was based on information and criteria from the 1990s that are now obsolete. The following is an assessment against the current BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to this site.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), any native vegetation belonging to an endangered EVC such as Floodplain Wetland Complex has a conservation significance rating of either High or Very High (depending on the habitat score). This translates to **State** significance under BioSites criterion 3.2.3, noting that the size and native vegetation cover of the Hays Paddock pond easily meet the requirements of this criterion.

Rare or threatened plants

At least eight of the plant species listed under the heading 'Flora of special significance' have viable populations at the Hays Paddock pond. Each one of these locally threatened species gives the site **Local** significance under BioSites criterion 3.1.5.

Rare or threatened fauna

The Nankeen Night Heron is listed as vulnerable in Victoria. One was observed on several occasions at the Hays Paddock pond, undoubtedly belonging to the large colony that roosts and nests at Kew Golf Club. The pond provides good habitat for this species, thereby qualifying for **Regional** significance under BioSites criterion 3.1.2.

The Great Egret is listed as vulnerable in Victoria, but the one-off sighting of an individual at Hays Paddock seventeen years ago is not of much significance.

There are at least six other fauna species recorded from the site that are threatened in Boroondara and have viable populations. Any locally threatened species that has a viable population gives the site **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Disturbance of waterbirds at the pond by humans and dogs.	Waterbirds	High to moderate	Current
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: White Bladder-flower (<i>Araujia sericifera</i>), Large-leafed Privet (<i>Ligustrum lucidum</i>), Water Couch (<i>Paspalum distichum</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Creeping Buttercup (<i>Ranunculus repens</i>), Castor Oil Plant (<i>Ricinus communis</i>), unidentified Willow (<i>Salix</i> sp.), Tobacco-bush (<i>Solanum mauritianum</i>), Wandering Jew (<i>Tradescantia fluminensis</i>); • Moderately serious: Box Elder (<i>Acer negundo</i>), Water Plantain (<i>Alisma lanceolata</i>), Aster-weed (<i>Aster subulatus</i>), Mirror-bush (<i>Coprosma repens</i>), Drain Flat-sedge (<i>Cyperus eragrostis</i>), Cocksfoot (<i>Dactylis glomerata</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Fennel (<i>Foeniculum vulgare</i>), Desert Ash (<i>Fraxinus angustifolia</i>), unidentified fumitory (<i>Fumaria</i> sp.), Galenia (<i>Galenia pubescens</i> var. <i>pubescens</i>), Cleavers (<i>Galium aparine</i>), Ox-tongue (<i>Helminthotheca echioides</i>), African Box-thorn (<i>Lycium ferocissimum</i>), Watercress (<i>Nasturtium officinale</i>), Toowoomba Canary-grass (<i>Phalaris aquatica</i>), Greater Plantain (<i>Plantago major</i>), White Poplar (<i>Populus alba</i>), Poplar (<i>Populus</i> sp.), English Oak (<i>Quercus robur</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Clustered Dock (<i>Rumex conglomeratus</i>), Black Nightshade (<i>Solanum nigrum</i>), Nasturtium (<i>Tropaeolum majus</i>), Verbena (<i>Verbena</i> sp.). 	All	Moderate	Current
Water pollution in Glass Creek.	Fish and other aquatic organisms	Moderate	Current
Displacement of small native birds by the aggressive Bell Miner and Noisy Miner.	Birdlife; Floodplain Riparian Woodland; large old trees	Moderate	Current
Occupation of tree hollows by pests such as feral bees and Common Mynas.	Hollow-dependent native fauna	Low to Moderate	Current
Predation by foxes and cats.	Birds, frogs	Low to moderate	Current

Threat	Natural assets affected	Severity	When?
Eucalypt dieback disease due to possums, psyllids, leaf skeletonisers, leaf miners or galls.	Floodplain Riparian Woodland; Hollow-bearing trees; Wildlife corridor	Low	Current
Borer attack of Silver Wattles (<i>Acacia dealbata</i>).	Floodplain Riparian Woodland	Low	Potential

Priority actions

1. Ban dogs swimming in the pond, which is the greatest detriment to the site's high significance for waterbirds. The importance of this action is high and the urgency is moderate, from the perspective of the whole municipality.
2. Investigate the possibilities for control of the introduced Eastern Dwarf Tree Frog in the pond, by consultation with Melbourne Water and the Amphibian Research Centre. The importance of this action is high and the urgency is moderate, from the perspective of the whole municipality.
3. Seek arboricultural advice about how to conserve large old tree number 6, e.g. by removing some of the extensive mistletoe. The importance and urgency of this action are moderate, from the perspective of the whole municipality.
4. If the ground around the base of large old tree number 4 is regularly bare (as seen in photo 8 below), consider use of mulch to reduce compaction of soil there. The importance and urgency of this action are moderate, from the perspective of the whole municipality.
5. Control Blackberry on the western side of the pond. This may require a cooperative effort with the owner of the Kilby Park Stud property. The importance and urgency of this action are moderate, from the perspective of the whole municipality.

Past management and revegetation

See 'site description' on page 329.

Future revegetation

To realise the excellent potential of the seasonal billabong beside Glass Creek in the park's south, it is recommended to destroy Kikuyu and re-plant with indigenous species of seasonal wetlands. Species of *Juncus* and *Persicaria*, as well as *Alisma plantago-aquatica*, *Eleocharis gracilis* (from Freeway Golf Course), *Eleocharis acuta* and *Glyceria australis* (from the pond to the north) would be good species to use, in massed planting. Some fringing *Melaleuca ericifolia* would further improve the habitat by creating seclusion, subject to limitations that Melbourne Water may impose to ensure that floodwater would not be unacceptably impeded. If possible, a broad area of shrub species from Floodplain Riparian Woodland (Appendix C) would be planted to the north and/or northeast of the seasonal billabong, to provide habitat for small insect-eating birds such as White-browed Scrubwrens. In this secluded location, there should be no concerns about providing cover for stalkers or criminals.

Care should be taken to avoid harming the large frog population at this billabong when using herbicide to kill the Kikuyu. To reduce the risk, it would be desirable to spray at most half of the billabong at a time and leave at least several days between sprays. This should mean that some of the frogs will not be sprayed at all. Spray only when the billabong is dry.

Records should be kept of any planting done in this (or any other) site, including species, numbers and locations.

Quadrat Monitoring

The pond at Hays Paddock was used as a quadrat (or vegetation study plot) on 6th June 1990 by Doug Froid. The data is stored in the Department of Sustainability & Environment's Flora Information System database with catalogue number E18041. The billabong was reassessed as quadrat N04086 by the author on 31st January 2005. In the table below, the entries in the columns headed 1990 and 2005 are Braun-Blanquet categories of vegetation cover: '+' = minor occurrence; '1' = <5% cover; '2' = 5-25% cover; '3' = 25-50% cover; '4' = 50-75% cover; '5' = >75% cover.

MGA coordinates 328965 m east, 5815935 m north. Quadrat area 6,000 m² (165 m long × 55 m at the widest point).

Species Name	1990	2005
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Species Name	1990	2005	Species Name	1990	2005	Species Name	1990	2005
Wild indigenous species			Planted indigenous species			Introduced species		
<i>Alternanthera denticulata</i>		1	<i>Myriophyllum crispatum</i>	2	+	<i>Callitriche stagnalis</i>	1	
<i>Azolla filiculoides</i>		1	<i>Neopaxia australasica</i>		1	<i>Cirsium vulgare</i>	+	
<i>Eleocharis acuta</i>	1	1	<i>Oxalis ?exilis/perennans</i>		1	<i>Cynodon dactylon</i>	1	
<i>Eleocharis sphacelata</i>	2	2	<i>Persicaria decipiens</i>	1	1	<i>Cyperus eragrostis</i>	+	+
<i>Epilobium hirtigerum</i>	+	1	<i>Ricciocarpos natans</i>		4	<i>Helminthotheca echioides</i>		+
<i>Eucalyptus camaldulensis</i>	+	+	<i>Triglochin procera</i>	2	2	<i>Lepidium didymum</i>	+	
<i>Euchiton sphaericus</i>	1		<i>Typha domingensis</i>	1	2	<i>Malva sp.</i>	+	
<i>Glyceria australis</i>		+	<i>Wolffia australiana</i>		1	<i>Modiola caroliniana</i>	+	
<i>Juncus amabilis</i>	+	1	Introduced species			<i>Paspalum distichum</i>	2	1
<i>Juncus australis</i>		+	<i>Acacia verticillata</i>		+	<i>Plantago major</i>	+	+
<i>Juncus bufonius</i>		1	<i>Acaena novae-zelandiae</i>		+	<i>Poa annua</i>	1	
<i>Juncus gregiflorus</i>		1	<i>Carex appressa</i>		+	<i>Ranunculus repens</i>	+	+
<i>Juncus pauciflorus</i>		+	<i>Dianella longifolia</i> s.l.		+	<i>Rorippa palustris</i>	1	+
<i>Juncus sarophorus</i>		+	<i>Melicytus dentatus</i>		+	<i>Rubus ?anglocandicans</i>		+
<i>Lachnagrostis filiformis</i>	1	1	<i>Poa labillardierei</i>		+	<i>Rumex conglomeratus</i>		+
<i>Lemna disperma</i>		3	Introduced species			<i>Rumex crispus</i>	1	
<i>Lythrum hyssopifolia</i>		1	<i>Alisma lanceolata</i>		+	<i>Salix babylonica</i> s.l.	+	
<i>Melaleuca ericifolia</i>	1	1	<i>Aster subulatus</i>	1	+	<i>Solanum nigrum</i>	+	+

The table above shows a substantial increase in the richness of wild indigenous species, and particularly the floating species that have come to dominate the pond. The relative amounts of the various floating species were seen to vary greatly between the author's inspections, which were from September 2004 to February 2005. This is probably due to a normal seasonal cycle. The only indigenous species that has declined is *Myriophyllum crispatum*.

Accompanying the expansion of indigenous wetland species has been the decline of all introduced species that had a substantial presence in 1990.

The planted species in the table are arguably not part of the wetland vegetation, but they have been planted within the zone of periodic inundation and their inclusion may assist future vegetation monitoring.

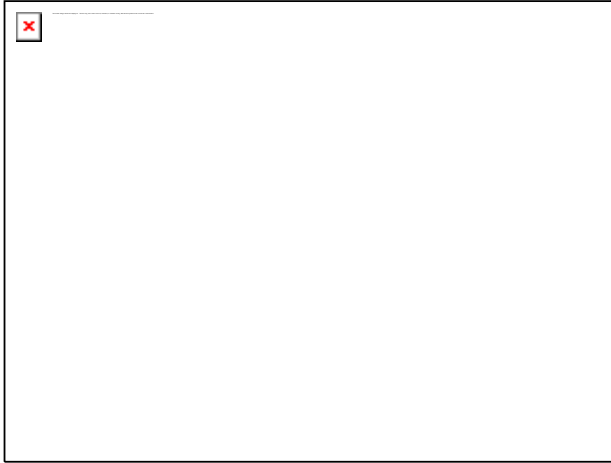
Other monitoring

In addition to the quadrat data, the following items have been gathered to provide a baseline for future monitoring:

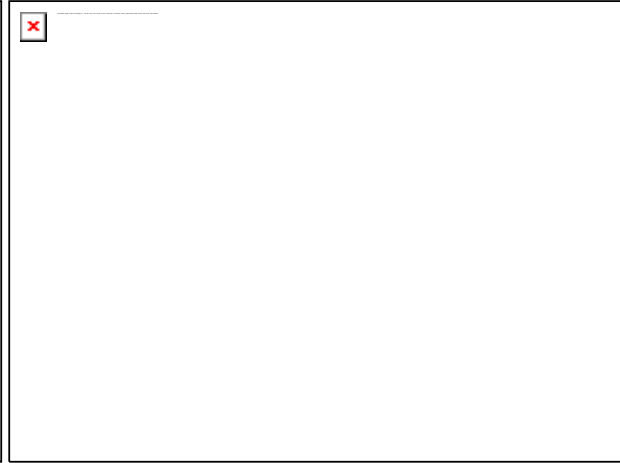
- The flora lists for the various parts of the site, as provided beneath the heading 'Full flora list' above. Repeat every four years or so. Check for loss or decline of indigenous species and shifts in abundances of weeds;
- Ratings of weed severity within each part of the site, stored in the database of this study. (Ratings for the park as a whole are given in the section headed 'Threats' above.);
- Tree health ratings, as tabulated under the heading 'Large old trees'. The data is also stored in the geographic information system data from this study;
- Population sizes of scarce, significant plant species. The locations and population sizes are given in the section headed 'Flora of special significance' on page 330. Check the populations every two to four years, noting that wetland species are naturally very variable in their relative abundances;
- The fauna list and twenty-minute bird census data. Repeat in spring every two to four years. Check for changes in abundance of birds, the particular species present and the species that are breeding;
- The monitoring photographs displayed on the following pages, with locations and orientations shown on the aerial photograph on page 330. Original digital images are kept in the data file for this project. Repeat the photographs about every two years. Check tree foliage density, the abundance of weeds and structural changes in the vegetation. Note that wetlands are naturally dynamic ecosystems, so substantial structural changes should be expected in the pond, both seasonally and between years.

Monitoring photographs for Hays Paddock

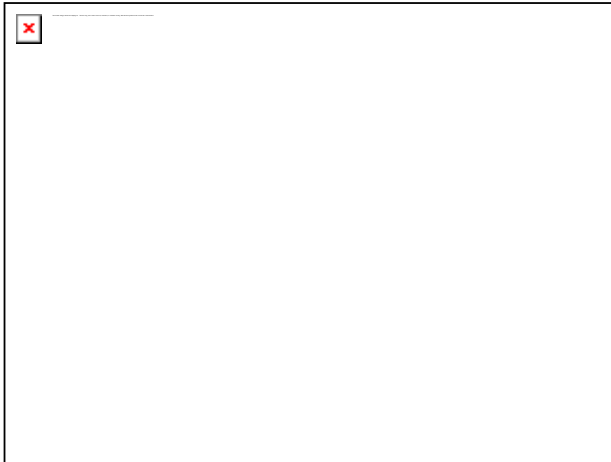
The locations and orientations of the photographs are shown by numbered arrows on the aerial photograph on page 328. Photos 1-9 were taken on 23rd February 2005, and photos 10 and 11 were taken on 31st January 2005.



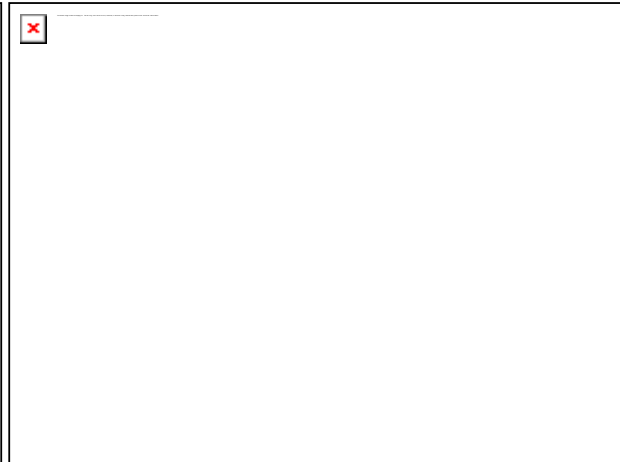
Site 35, Photo 1. A view of the western edge of the pond from near the northern tip, to show the zonation of the wetland vegetation, the abundance of floating plants and the stage of growth of fringing revegetation.



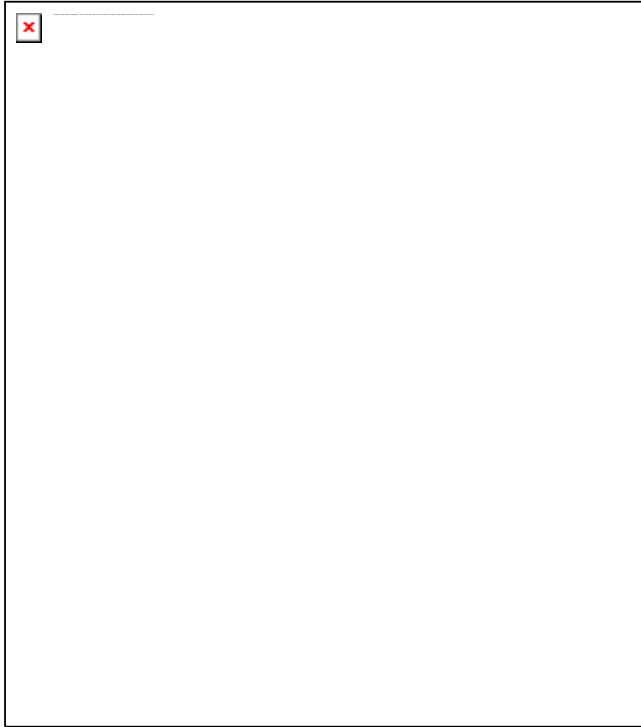
Site 35, Photo 2. The northeastern corner of the pond, showing the zonation of the wetland vegetation.



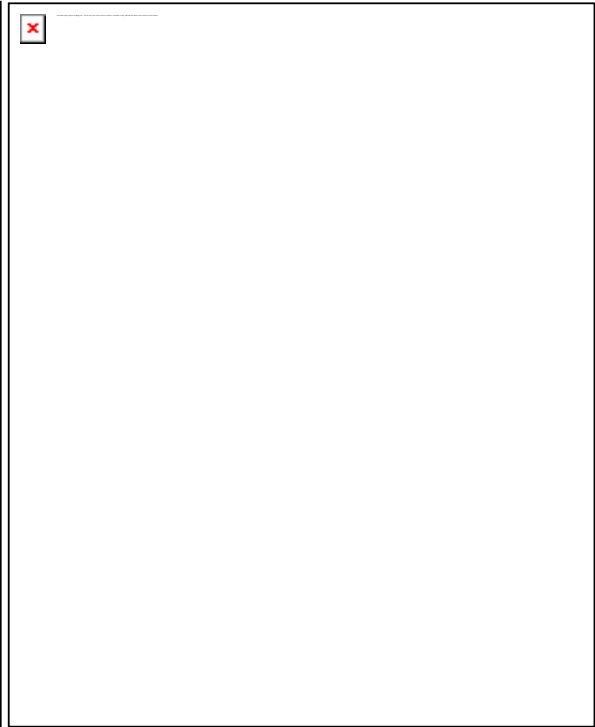
Site 35, Photo 3. Looking west across the middle of the pond, to show the abundance of floating plants, the condition of the island and the proportions of *Typha*, *Eleocharis* and *Triglochin* in the water.



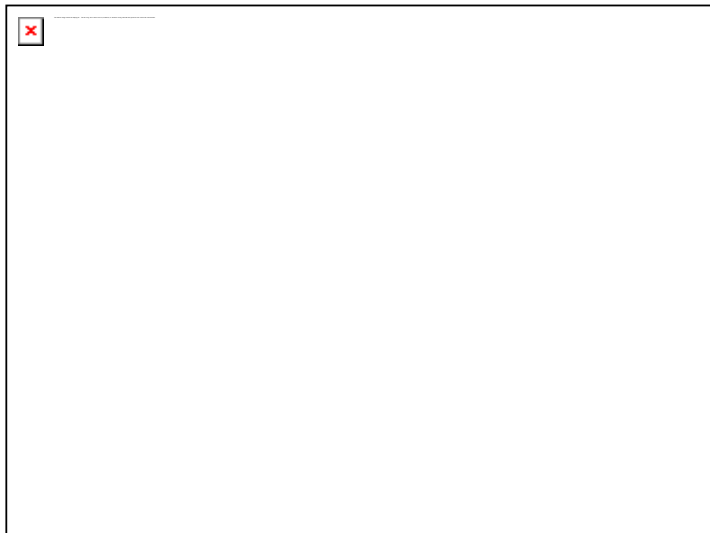
Site 35, Photo 4. Looking north across the main point at which dogs enter the pond, with the main waterbird breeding area on the opposite bank.



Site 35, Photo 5. Large old tree number 7, at the southeast of the car park. This photograph is to show the tree's structure and foliage density, which is representative of the large old trees in the park generally.

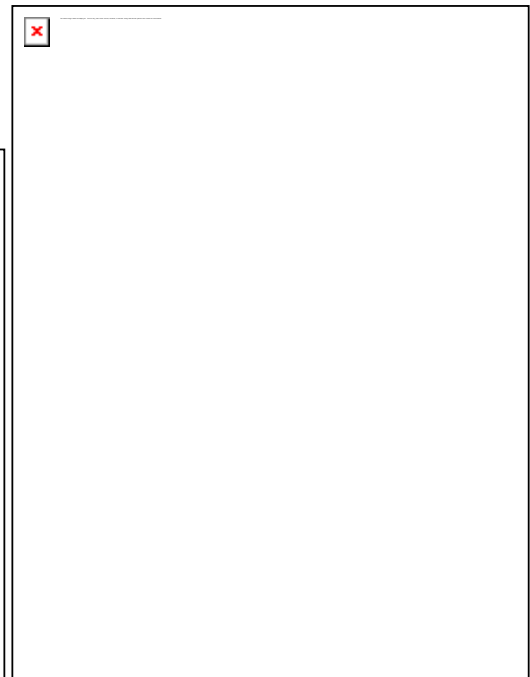


Site 35, Photo 6. Large old tree number 5. This photograph is for the same purposes as Photo 5. The health of this tree was marked down for the condition of the bark on its bole, but was still deemed to be good.

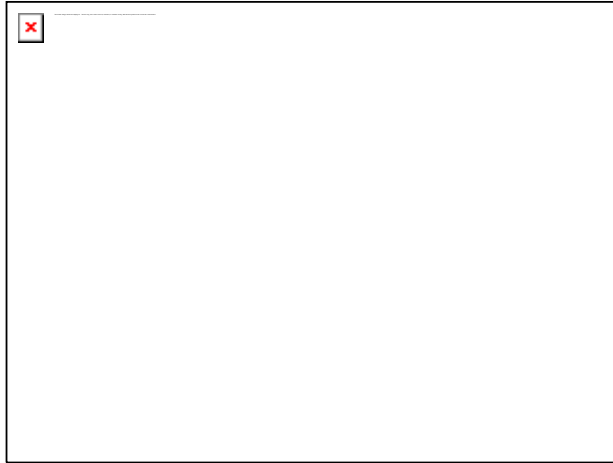


Site 35, Photo 7. A view along Glass Creek to show:

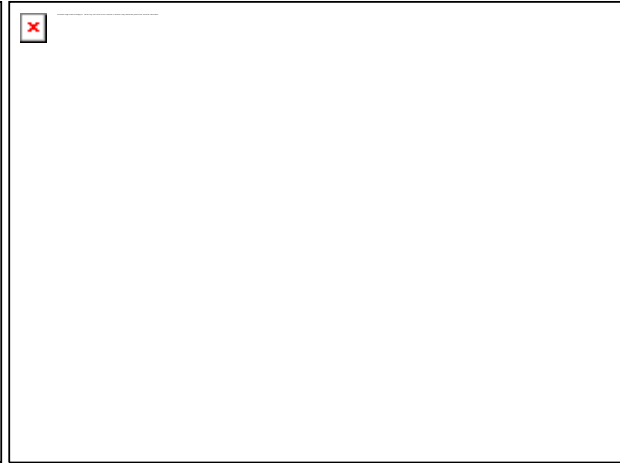
- Recent revegetation on the left (with several volunteer *Persicaria lapathifolia*);
- Weeds between the revegetation and the creek, as well as on the opposite bank. The prominent species are *Conyza sumatrensis*, *Ricinus communis* and *Verbena* sp.



Site 35, Photo 8. Large old tree number 4, showing good regeneration of foliage following dieback during the recent drought. Note also the bare ground at the base of the tree, which may indicate a need for mulching.



Site 35, Photo 9. The seasonal billabong in the park's south, showing the dominance of Kikuyu around it, two large old trees behind (numbers 2 & 3), and a patch of *Persicaria lapathifolia* in the water. This area is recommended for a major wetland landscaping project.



Site 35, Photo 10. A particularly weedy section of the bank of Glass Creek, with remnant trees dead and in poor health.



Site 35, Photo 11. A dense patch of the weed, Tobacco-bush, growing over revegetation plants within tree guards. The scene should soon become one where the Tobacco-bushes are removed and their greenery replaced by the indigenous plantings.

Information sources used in this assessment

- Brief inspections of the park by the author with staff of the City of Boroondara on 6/9/04 and with members of the Friends of Glass Creek Parklands on 30/1/05, which included taking fauna observations from Elizabeth Xipell;
- A vegetation and habitat survey by Dr Lorimer for a total of 5½ hours on 6/9/04, 25/11/04, 31/1/05 and 23/2/05, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species in each of five parts of the site, including the species' abundances and the threat level of all weed species in each area;
 - Assessment and documentation of quadrat N04086 for comparison against quadrat E18041 of 1990;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Individual measurement and health assessment of large old trees;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;

- A daytime bird survey of the site by David Lockwood on 18/10/04 according to the protocol discussed in Section 2.4.1, including a twenty-minute bird census;
- Spotlighting sessions for forty minutes on 12/10/04 and fifty minutes on 8/11/04;
- Frog call surveys for 20 minutes on 12/10/04 and 40 minutes on 18/10/04, including the playing of taped frog calls to elicit responses from the frogs that were present;
- A report of sightings of Tiger Snakes, by Janyce McMurtrie at the City of Boroondara;
- Additional fauna records published by Beardsell (1997 – the NEROC report) – see the Bibliography;
- Discussions about the history of the Hays Paddock pond with landscape architect Mark McWha, who was instrumental in the billabong's restoration following construction of the Eastern Freeway;
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases, including quadrats E18041 and E18042 (the latter of which seems to be just a small subset of the former) and fauna records by Steve Rowe and Fred T.H. Smith;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

In addition to the recommendations under the headings 'Monitoring' and 'Priority actions', an investigation is recommended into the source of the cloudy, odorous pollution of Glass Creek that was observed by the author. Members of the Friends of Glass Creek Parklands have observed such pollution from time to time.

It would also be desirable to determine whether the Broadfin Galaxias still occurs in Glass Creek. It was found in the last two fish surveys, both in 1992.

Acknowledgment

Thanks to members of the Friends of Glass Creek Parklands for taking the author for a walk around the park and explaining their interests and concerns about the area.

Site 36. Kilby Park Stud, Kew East

Part of a private property containing Glass Creek, a dam and associated native vegetation. Melway ref. 45 J1.

Site Biological Significance Level: *Local*

Summary of the most significant natural assets:

- A corridor of approximately forty-five River Red Gums lining Glass Creek, one of which is a large old tree (in mediocre health);
- The locally vulnerable, migratory fish species, Broadfin Galaxias;
- Secure populations of two wetland plant species that are threatened in Boroondara, and one that is rare in Melbourne generally.

Aerial photograph

See page 328, which also covers Hays Paddock.

Boundaries

This site is labelled and outlined in red on the aerial photograph on page 328. The boundaries have been drawn as a simple shape that encompasses the native vegetation and creek.

Land use & tenure

Private property, used as part of a wholesale plant nursery.

Physical features

Site area: 0.93 hectare

Elevation: 11 to 14 m.

Slope: Typically 1:15 on the floodplain, and steep (exceeding 1:1 in places) on the embankments of the creek channel.

Landform: Floodplain with a perennial creek.

Soil type: Sandy alluvium.

Underlying geology: The bedrock is Silurian sedimentary rock of the Dargile formation, which is dominated by sandstone.

Site description

The Kilby Park property was a historical horse stud and it now has a wholesale plant nursery. Most of the property has had no native vegetation for many years, but there are still:

- Approximately forty-five River Red Gums along the riverbank of Glass Creek, concentrated near the Hays Paddock fence;
- Moderate numbers of some hardy indigenous amphibious species in or beside the creek, along with one individual of the locally endangered *Callistemon sieberi*.

There is also a farm dam that has been included in the site circumscribed here because it is covered with uncommon floating plants (particularly *Wolffia australis*) and has two locally threatened species of Cumbungi (*Typha*) at its edge.

Glass Creek is periodically polluted and it flows through a pipe for over 100 m beneath the Eastern Freeway immediately downstream from the property. However, migratory native fish were found in the creek when the last two fish surveys were undertaken (in 1992).

Ecological links with other land

The corridor of River Red Gums along Glass Creek augments the habitat in the abutting Hays Paddock. The corridor may also help to provide an ecological link to the Yarra River ecological corridor on the opposite side of the Eastern Freeway, with Kew Golf Club (Site 7, page 107) directly over the freeway. However, the extent to which native fauna move along this section of Glass Creek could not be discerned in this study.

Glass Creek functions as a corridor for migration of native fish, including the locally vulnerable migratory species, Broadfin Galaxias (*Galaxias brevipinnis*), which has been found near the fence between the Kilby Park Stud property and Hays Paddock.

Habitat types

Water Body (No EVC number). The dam provides open water habitat for ducks, frogs and other aquatic life.

Floodplain Riparian Woodland (EVC 56, **endangered** in the Gippsland Plain bioregion). Represented by a somewhat fragmented canopy of River Red Gums (mainly in the east), and scattered native understorey plants beside Glass Creek. Six indigenous plant species were found.

Canopy trees: A pure stand of *Eucalyptus camaldulensis*.

Lower trees: None.

Shrubs: One specimen of the characteristic species, *Callistemon sieberi* (marked on the aerial photograph).

Vines and ferns: There are no indigenous vines or ferns.

Ground flora: *Isolepis cernua*, *Juncus gregiflorus* and *Persicaria decipiens* are fairly abundant.

Floodplain Wetland Complex (EVC 172, **regionally Endangered**), incorporating Billabong Wetland.

The dam was seen fully covered with floating plants that are characteristic of this EVC, but the only other indigenous species were *Typha domingensis* and *Typha orientalis*. Taking into account the low botanical diversity and the artificial topography, the dam could be deemed a facsimile of the EVC rather than a genuine representation of it.

Woody plants: Absent.

Dominant species: At the time of the inspection, there was effectively 100% cover of indigenous floating species.

Wolffia australiana was dominant, and there were large numbers of *Azolla filiculoides* and *Lemna disperma*. *Typha domingensis* and *Typha orientalis* grow at the water's edge, along with moderate numbers of the weed, *Cyperus eragrostis*.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Notes
Melbourne	Boroondara		
Rare or threatened	Secure	<i>Wolffia australiana</i>	Covering the dam, on 7/2/05.
	Endangered	<i>Typha orientalis</i>	Growing at the edge of the dam.
	Endangered	<i>Callistemon sieberi</i>	A solitary individual.
	Vulnerable	<i>Typha domingensis</i>	Growing at the edge of the dam.

Flora list

The indigenous species recorded from the Kilby Park Stud property are listed below, with separate columns for the riverbank and dam.

Species Name	Riverbank	Dam
<i>Azolla filiculoides</i>		Many
<i>Callistemon sieberi</i>	1 only	
<i>Eucalyptus camaldulensis</i>	Many	
<i>Isolepis cernua</i>	Many	
<i>Juncus gregiflorus</i>	Many	
<i>Lemna disperma</i>		Many
<i>Muellerina eucalyptoides</i>	Few	
<i>Persicaria decipiens</i>	Scattered	
<i>Portulaca oleracea</i>	Scattered	
<i>Typha domingensis</i>		Secure
<i>Typha orientalis</i>		Secure
<i>Wolffia australiana</i>		Dominant

Portulaca oleracea is included above for completeness, but is probably not genuinely indigenous in Boroondara. The only introduced species at the Kilby Park Stud property that represented any significant weed threat or impact was *Cyperus eragrostis*. There were moderate numbers of this species around the dam, representing a fairly minor threat to the dam's ecological values.

Large old trees

One River Red Gum (*Eucalyptus camaldulensis*) on the north bank of Glass Creek has a trunk diameter of 80 cm, thereby just qualifying as a large old tree according to the Department of Sustainability & Environment's criterion for Floodplain Riparian Woodland. The tree is marked on the aerial photograph on page 328 with a yellow circle and the number 10. Its health was assessed as fair, and it will probably need an arborist's care if it is going to survive for many more years.

Fauna of special significance

The significant fauna species in the list below have been observed at the Kilby Park Stud. The conservation status ratings 'vulnerable' and 'endangered' are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Last Record	Notes
Melbourne	Boroondara			
Vulnerable	Vulnerable	Broadfin Galaxias	1992	Substantial numbers found on both occasions when sought.
	Endangered	Spotted Marsh Frog	2005	A solitary male was heard at the dam.

Full fauna list

The duration of the visit to this site was only one hour, so no meaningful fauna list can be provided.

Site significance ratings

This site is part of the Department of Sustainability & Environment's BioSite number 5063, which extends along the Yarra River from Burke Rd to Chandler Hwy, on both sides of the river. The significance level given in the BioSites database is 'Regional', but this was based on information and criteria from the 1990s that are now obsolete, and it does not distinguish between the values of individual properties within the BioSite. The following is an assessment against the current BioSites criteria of the Department of Sustainability & Environment (Amos 2004), specifically for the Kilby Park Stud property.

Ecological integrity & viability

BioSites criterion 1.1.1 attributes **Local** significance to 'All parts of riparian systems with riparian vegetation present', which applies to this site.

Regionally threatened Ecological Vegetation Class

The EVCs associated with the site are endangered, but they are represented by such heavily modified vegetation that the BioSites criteria for threatened EVCs are not met.

Rare or threatened plants

Wolffia australiana, *Typha orientalis* and *Typha domingensis* appear to be secure at the dam. Each one of these locally threatened species gives the site **Local** significance under BioSites criterion 3.1.5.

Rare or threatened fauna

The locally vulnerable Broadfin Galaxias was found in substantial numbers on both occasions that the creek has been surveyed for fish, in March and September 1992. There is no reason to believe that this species is no longer present. Any locally threatened species that has a viable population gives the site **Local** significance according to BioSites criterion 3.1.5.

Waterway protection

All riparian vegetation has a Very High hazard rating for waterway protection according to Appendix 1 of *Victoria's Native Vegetation Framework* (NRE 2002a). This is separate from conservation significance, and indicates the level of importance that should be placed on protecting, restoring and revegetating riparian vegetation such as in the present site.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Water pollution in Glass Creek.	Fish and other aquatic organisms	Moderate	Current

Threat	Natural assets affected	Severity	When?
Eucalypt dieback disease due to possums, psyllids, leaf skeletonisers, leaf miners or galls.	Trees; Wildlife corridor	Moderate	Current

Priority action

It would be wise to seek arboricultural advice about conserving the large old River Red Gum marked as number 10 on the aerial photograph on page 328, as well as two River Red Gums near the dam and one midway between trees 10 and 8 on the aerial photograph.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer and an assistant for one hour on 7th February 2005, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species in each of two parts of the site, including the species' abundances and the threat level of weed species in each area;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Individual measurement and health assessment of the larger River Red Gums;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Information from the Department of Sustainability & Environment's fauna and BioSites databases, including fish surveys from March and September 1992;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Acknowledgment

Thanks to owner of the property for granting permission to inspect it.

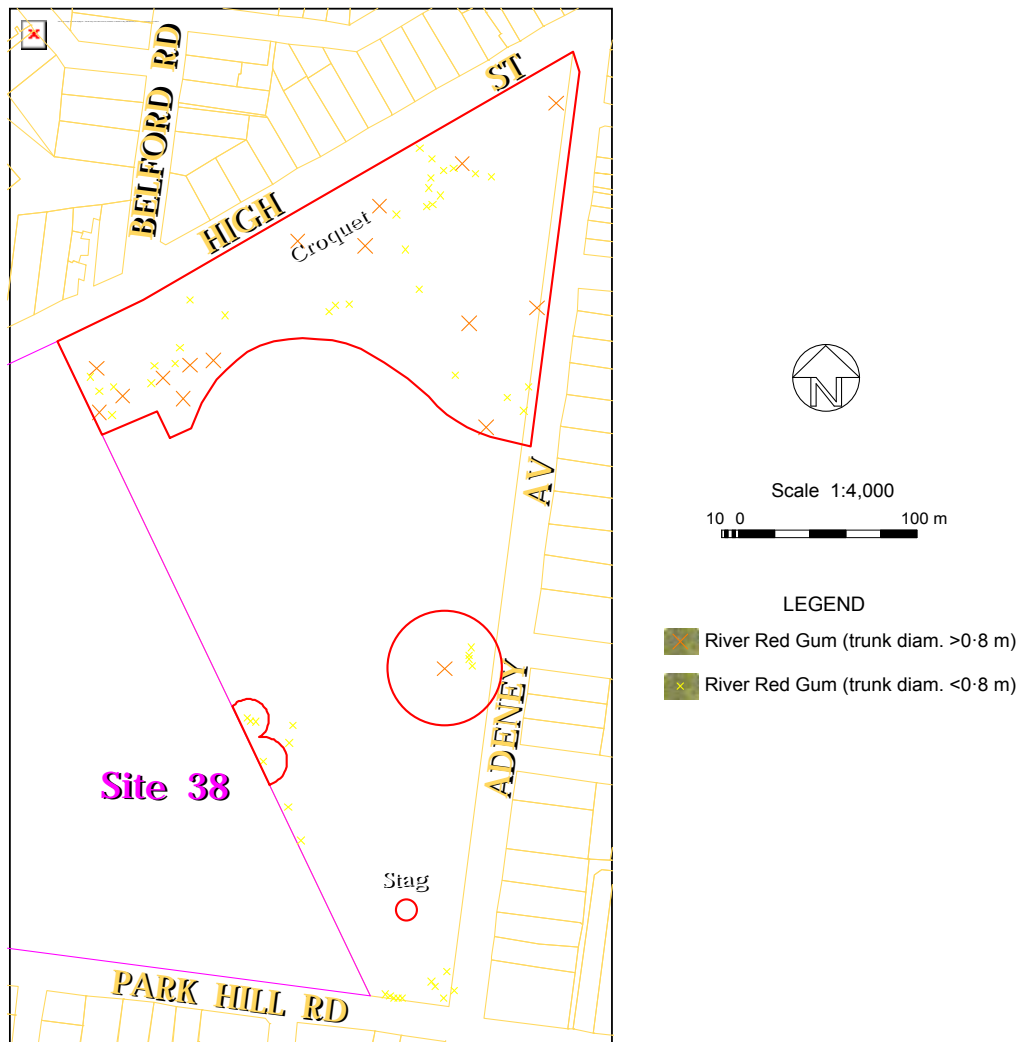
Site 37. Victoria Park, Kew

Sections of an amenity park with remnant River Red Gums and revegetation plots. Melway ref. 45 G5.

Site Biological Significance Level: *Below the BioSites Rating Threshold*

Summary of significant natural assets

- Seventy-two River Red Gums up to several centuries old and with trunks up to 2 metres in diameter.



Boundaries

The site of biological significance is taken here to comprise the four sections outlined in red on the aerial photograph. The boundary of the largest section comprises (in clockwise order) the High St property boundary, the kerb of Adeney St, paths to the north of the tennis courts and northern oval, the edge of the groundsman's premises and the property boundary abutting Site 38 (Boroondara General Cemetery, outlined in magenta). The circle around the marked stag (or dead tree trunk) in the south coincides with a fence around the tree. The other two, more centrally located sections of the site have outlines based on circles representing Tree Protection Zones around each remnant River Red Gums within them. The radius of the tree protection zone around each tree is eighteen times the trunk diameter, corresponding to the Tree Protection Zone recommended by Matheny and Clark (1998) for over-mature trees belonging to species that are sensitive to root disturbance. This results in a circle of radius 32.4 m for the group of trees just south of the tennis courts, centred on the very large tree there.

Land use & tenure: Public Park run by the City of Boroondara.

Physical features

Site area: 3.37 hectares total (within the four sections)

Elevation: 35 to 50 metres

Landform: A very shallow valley that originally had the headwaters of Connor Creek running approximately along the course of the driveway between High St and Adeney St, flowing to the northwest.

Slope: Typically 1:20, sloping toward the driveway (except for the sports fields).

Soil type: Sandy, orange-brown loam topsoil over clay subsoil.

Underlying geology: The park lies on the Dargile Formation, an Upper Silurian formation characterised mainly by sandstones.

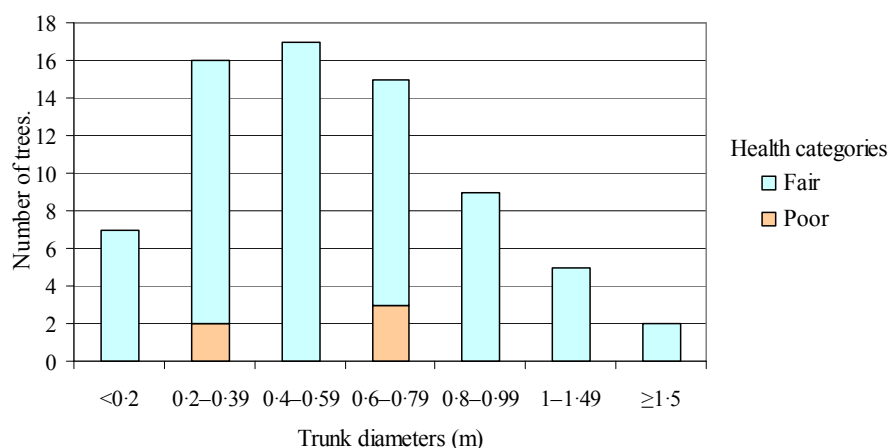
Site description

Victoria Park's biological and landscape significance derives mainly from its large River Red Gums (*Eucalyptus camaldulensis*), whose trunks measure up to 1.9 m in diameter (or 2.0 m in the case of the stag marked on the aerial photograph). Indications from the adjoining Boroondara General Cemetery are that a century-old River Red Gum has a trunk diameter of approximately 0.6 m (p. 353), so the largest trees in Victoria Park are several centuries old.

Trees with a trunk diameter of at least 0.8 m qualify as a 'large old tree' according to the Department of Sustainability & Environment. The sixteen live trees of this size in Victoria Park are marked with orange crosses on the aerial photograph. Smaller River Red Gums are shown with yellow crosses, bringing the total number of River Red Gums to 72.

The largest living tree on the site grows within the hedge on the southern side of the croquet lawn. It is included in the Boroondara Significant Tree Register (John Patrick Pty Ltd, 2001) as tree 94, for its age and aesthetic appeal, but the tree's size is grossly understated in the register.

The identity, dimensions and health of the trees were documented in a March 2004 study by Dean Simonsen of TreeLogic Pty Ltd. River Red Gums were the only indigenous species found by Simonsen. The range of trunk diameters and health of the live trees as recoded by Simonsen is summarised by the histogram below.



All trees with trunk diameters smaller than 0.2m have been planted, as well as some or all of the trees in the next size category on the histogram. Note that sixty-six of the seventy-one live trees were classified by Simonsen as being in fair health and the remaining five were classified as poor.

The present author reassessed all seven of the River Red Gums with trunk diameters of one metre or more. In the reassessment, five trees were rated as being in good health (two of them approaching fair health) and two were rated as being in fair health. By comparison, Simonsen rated them all as being in fair health. Comparing photographs taken by Simonsen with photographs taken in the present study (7th July 2005), it appears that there had been a small amount of new growth on some of the trees between the two assessments, but that there was also a small difference between the views of the two assessors. In particular, Simonsen appears to have placed more emphasis than the present author on the trees' structure and the size of their crowns.

The park's trees are frequented by Sulfur-crested Cockatoos and other parrots, some of which nest in the tree hollows. Various other woodland birds were also observed in the trees.

The only naturally occurring indigenous plant species other than the River Red Gums are Common Cotula (*Cotula australis*), Weeping Grass (*Microlaena stipoides*), Clustered Wallaby-grass (*Austrodanthonia racemosa*) and Toad Rush (*Juncus bufonius*). These are all moderately common in Melbourne lawns. Their main competitors are the annual weeds, Squirrel-tail Fescue (*Vulpia bromoides*) and Four-leafed Allseed (*Polycarpon tetraphyllum*).

To help conserve the trees, and for more general conservation reasons, Council has established mulched revegetation plots beneath many of the River Red Gums. The species that have been planted were recorded during this study's fieldwork as follows:

<i>Acacia acinacea</i>	<i>Allocasuarina littoralis</i>	<i>Dianella longifolia</i>	<i>Lomandra longifolia</i>
<i>Acacia dealbata</i>	<i>Austrodanthonia setacea</i>	<i>Dichelachne crinita</i>	<i>Poa labillardierei</i>
<i>Acacia implexa</i>	<i>Chrysocephalum apiculatum</i>	<i>Indigofera australis</i>	<i>Pomaderris aspera</i>
<i>Acacia melanoxylon</i>	<i>Chrysocephalum semipapposum</i>	<i>Kennedia prostrata</i>	<i>Wahlenbergia luteola</i>
<i>Acacia verticillata</i>	<i>Daviesia leptophylla</i>		

Ecological links with other land

This site abuts Boroondara General Cemetery (Site 37) and there is extensive movement of birds (and no doubt insects and pollen) between the two sites.

There is a corridor of planted Australian native trees from the other side of High St to the Yarra River, 1.4 km to the northwest. This corridor follows the course of Connor Creek, which once flowed through Victoria Park.

Habitat type

The park would originally have supported Plains Grassy Woodland (EVC 55, endangered in the Gippsland Plain bioregion), but native understorey now provides less than 10% cover, apart from the revegetation plots.

Fauna of special significance

Conservation Status in Boroondara	Species Name	Last Record
Endangered	Spotted Pardalote	2004
Vulnerable	Eastern Rosella	2001

Full fauna list

The following species were observed during this study (10/11/04 and 7/7/05) or in a list from 12/5/01 kept by the Department of Sustainability & Environment. The list is certain to be quite incomplete. Asterisks denote introduced species and obelisks (†) denote species for which breeding was confirmed.

Birds

*Spotted Turtle-Dove	2001	White-plumed Honeyeater	2001
Sulphur-crested Cockatoo	2004	Magpie-lark	2004
Rainbow Lorikeet	2004	Willie Wagtail	2004
Eastern Rosella	2001	Grey Butcherbird	2004
<u>Red-rumped Parrot</u>	2004	†Australian Magpie	2004
Tawny Frogmouth	2005	Little Raven	2001
Spotted Pardalote	2004	*†Common Blackbird	2004
Red Wattlebird	2001	*Common Starling	2004
Brush Wattlebird	2005	*†Common Myna	2004
Noisy Miner	2004		

Butterflies

Australian Painted Lady 2004

Fauna habitat

Native birds are fairly abundant in the park's trees (particularly the River Red Gums). Hollows in the River Red Gums were seen occupied by nesting Red-rumped Parrots and Common Mynas, and other hollows could be used by various native birds, bats and possums. There is also an unconfirmed report of parrots nesting in hollows in the stag at the southern end of the park. The stag is included within the site for its likely future use as a nesting site. Many birds were seen crossing between this site and trees in the adjacent Boroondara General Cemetery.

Site significance rating

The BioSites criteria of the Department of Sustainability & Environment (Amos 2004) do not recognise any biological significance of isolated trees, regardless of their size (except for rare individuals that have particular importance to science). This site therefore has a rating of 'Not significant' by the BioSites criteria.

This should not be taken to imply that the centuries-old trees in Victoria Park are not significant when considered against criteria related to heritage or aesthetics.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as the ones of interest here. However, the latest version states, '*Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats*'. The last sentence is not correct in the context of Victoria Park or Boroondara more generally.

Threats

The following threats to the park's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Drought stress of River Red Gums, potentially exacerbated by the presence of trees and shrubs in revegetation plots beneath the trees.	River Red Gums	High	Potential
Eucalypt dieback disease associated with psyllids and/or leaf miners.	River Red Gums	Moderate	Potential
'Invasion by resource competitors', specifically, honey bees, Common Mynas and/or Common Starlings occupying tree hollows that would otherwise be nest sites for native birds or bats.	Parrots, bats	Low	Current

Priority actions

1. Periodically check the health of the River Red Gums (particularly the larger ones) during periods of drought, and commence watering when drought stress is observed. This is a matter of high importance because of the value of the large trees. Monitoring water stress has become more important than in the past because many of the River Red Gums now have to compete for water with rapidly growing young trees in the revegetation plots. Climate change may also increase the need for watering in future.
2. Check for occupation of nest hollows by pest species each spring and evict them as appropriate.

Monitoring

Photographs 1 to 7 in the 2004 report by Dean Simonsen (see below) are useful for monitoring the structure of many of the River Red Gums and the density of foliage in their crowns. Replicates of these photographs were taken on 7/7/05 and are shown below. The locations and orientations of the photographs are marked on the aerial photograph on p. 159.

Simonsen's report also gives ratings of the trees' health and structure. Together, the photographs and ratings will be useful for future monitoring. Monitoring should occur at least every five years, and more frequently in times of drought.

Note that Simonsen's health ratings sometimes match the present author's but tend to be slightly poorer on average. A good example is illustrated by Photo 6 below, which depicts tree number 247, beside Adeney St opposite Segtoun St. Its health is rated as good here but fair by Simonsen, even though there is no sign of change between the two assessor's photographs.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for three hours and twenty minutes on 10/11/04 and forty minutes on 7/7/05, using this study's standard approach described in Section 2.3. This included:
 - Compilation of a list of indigenous plant species, planted indigenous species and environmental weeds;
 - Assessment of the health of all River Red Gums with trunk diameters of at least 1.0 metres;
 - Photographs to match photographs 1 to 7 of Simonsen's report (see below);
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;

- A 27-page report by Dean Simonsen of TreeLogic Pty Ltd for the City of Boroondara, titled '*Arboricultural Assessment and Report, Victoria Park, High St, Kew*', dated March 2004 and stamped 'Draft';
- The 289-page '*City of Boroondara Significant Tree Study*' by John Patrick Pty Ltd, dated May 2001;
- Data from the Department of Sustainability & Environment's fauna database;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

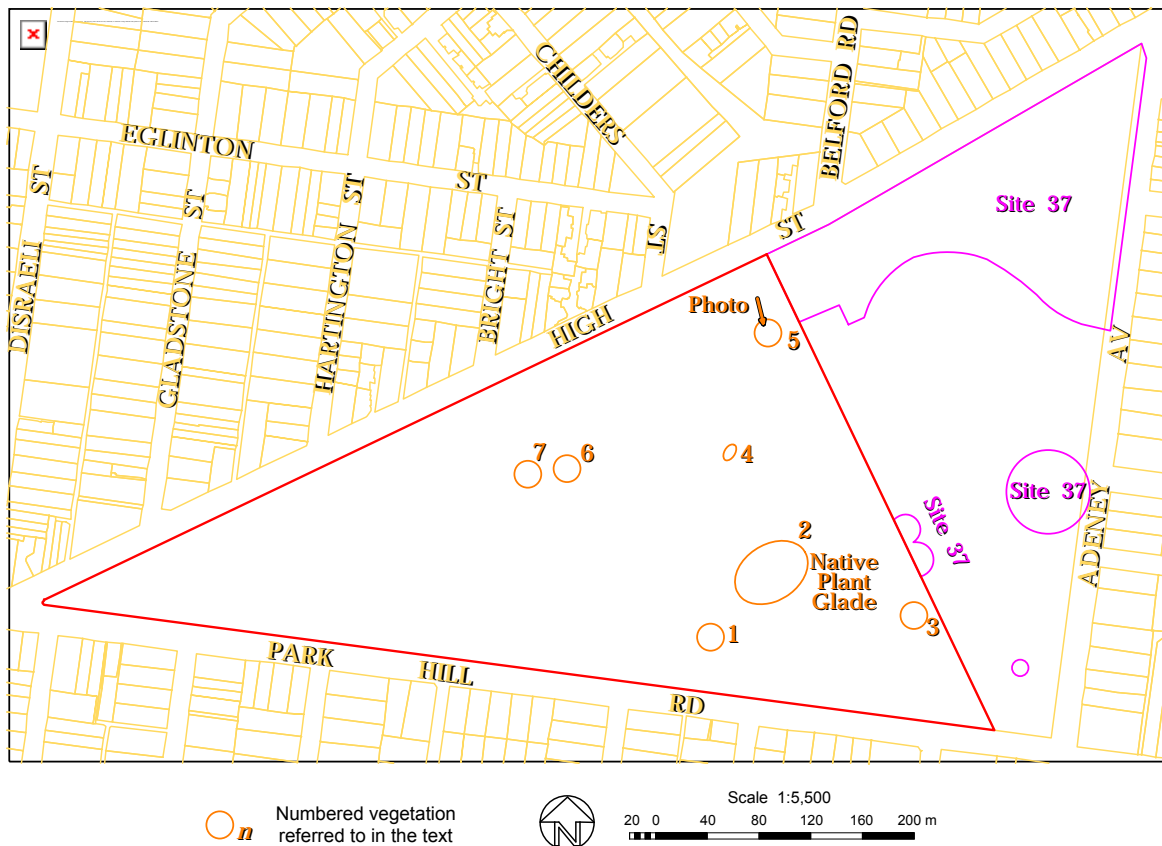
Site 38. Boroondara General Cemetery, Kew

A 145-year-old cemetery where indigenous ground flora plants and some trees persist. Melway ref. 45 F5.

Significance Level: *Local*

Summary of significant natural assets

- Large numbers of two locally threatened plant species and reasonable numbers of two others;
- Five old River Red Gums that help determine the relationship between trunk diameter and age for this species.



Boundaries

The site of biological significance is taken here to occupy the whole of Boroondara General Cemetery, outlined in red on the aerial photograph. Its boundary coincides with the property boundary. Indigenous plants are scattered across most of the property, but not around the buildings in the west. The magenta outlines are the parts of Victoria Park that constitute Site 37.

Land use & tenure: Public cemetery, run by a trust.

Physical features

Site area: 12.8 hectares

Elevation: 37 to 63 metres

Landform: Gentle, north- to north-east facing slope on the flank of a low, east-west ridge.

Slope: Between 1:20 in the northeast and 1:12 in the west.

Soil type: The western tip of the cemetery has sandy soil and the rest of the site has sandy, orange-brown clay loam topsoil over clay subsoil, but spoil from grave digging has upset the natural soil profile.

Underlying geology: Tertiary sands of the Red Bluff group cover the cemetery's western tip. The remainder of the cemetery lies on the Dargile Formation, an Upper Silurian formation characterised mainly by sandstones.

Site description

Cemeteries often support remnant ground flora, and Boroondara General Cemetery is a typical example. Indigenous grasses and lilies have persisted throughout the cemetery's 145-year history, going through scores of generations. A small number of indigenous trees continue to volunteer themselves on graves.

Disturbance of soil during grave digging has prompted germination of indigenous plants. Most weeds struggle to grow in the subsoil that comes to the surface, but indigenous species are more tolerant.

Verbal reports from local naturalists Ken Duxbury and Peter Lynch independently indicate that there were several indigenous species of grass and lilies present until the last few years that were not detected in the present study. The apparent loss of these species appears to be due to extensive use of herbicide. Many indigenous plants were seen dead, showing clear signs of having been sprayed. It seems that species which had survived nearly one and a half centuries of manual weed control have succumbed rapidly in the age of chemical use. Without their competition, annual weeds appear to be proliferating.

Although indigenous plants are scattered around almost the whole cemetery (except near the buildings), there is a concentration of them in the area labelled 'Native plant glade' on the aerial photograph. This area has been planted with Sugar Gums (*Eucalyptus cladocalyx*) and some other non-indigenous eucalypts. The indigenous wattles, *Acacia implexa* and *Acacia melanoxylon* have volunteered beneath the eucalypts, along with the woody weeds, *Pittosporum undulatum* and *Coprosma repens*. Many plants of the indigenous Rough Spear-grass (*Austrostipa scabra*) were seen in the glade, most of them recently killed by herbicide. Native birds appeared to congregate in the glade.

Ecological links with other land

This site abuts Victoria Park (Site 37) and there is extensive movement of birds (and no doubt insects and pollen) between the two sites. There is a corridor of planted Australian native trees from the other side of High St to the Yarra River, 1.4 km to the northwest.

Habitat types

The cemetery would originally have supported Grassy Woodland at the western tip (near the entrance and buildings) and Plains Grassy Woodland elsewhere. There are no remaining plants of the former vegetation type, and only scattered vestiges of the latter, as described below:

Plains Grassy Woodland (EVC 55, **endangered** in the Gippsland Plain bioregion)

Canopy trees: Small numbers of scattered *Eucalyptus camaldulensis* that have volunteered on graves.

Lower trees: *Acacia implexa* and *Acacia melanoxylon*, the former being confined to the 'Native plant glade' shown on the aerial photograph.

Shrubs: No indigenous shrubs remain.

Vines and ferns: None.

Ground flora: The native grasses, *Austrodanthonia racemosa*, *Austrostipa scabra*, *Chloris truncata* and *Lachnagrostis filiformis* are scattered in substantial numbers, as is the small sedge, *Lomandra filiformis* subsp. *coriacea*. Peter Lynch reports seeing *Gahnia radula*, at least until recent years. The indigenous annuals *Epilobium billardierianum* subsp. *cinereum*, *E. hirtigerum* and *Pseudognaphalium luteo-album* are more abundant than any other site visited in this study, no doubt in response to the cemetery's regimen of herbicide use.

Flora of special significance

In addition to the following species, Ken Duxbury recalls seeing an undetermined species of *Dianella* that would be significant, but it was not seen in this study.

Conservation Status in Boroondara	Species Name	Last Record	Notes
Critically Endangered	<i>Chloris truncata</i>	2004	Numerous
Critically Endangered	<i>Gahnia radula</i>	c. 2000	Reported by Peter Lynch
Endangered	<i>Pseudognaphalium luteoalbum</i>	2004	Numerous
Vulnerable	<i>Stipa scabra</i> subsp. <i>falcata</i>	2004	Suffering from herbicide
Vulnerable	<i>Amyema quandang</i>	2004	On <i>Acacia melanoxylon</i>

Full indigenous flora list

<i>Acacia implexa</i>	<i>Crassula decumbens</i>	<i>Lachnagrostis filiformis</i>
<i>Acacia melanoxylon</i>	<i>Epilobium billardierianum</i> ssp. <i>cinereum</i>	<i>Lomandra filiformis</i> ssp. <i>coriacea</i>
<i>Amyema quandang</i>	<i>Epilobium hirtigerum</i>	<i>Microlaena stipoides</i>
<i>Austrodanthonia racemosa</i>	<i>Eucalyptus camaldulensis</i>	<i>Pseudognaphalium luteoalbum</i>
<i>Austrostipa scabra</i> ssp. <i>falcata</i>	<i>Gahnia radula</i> (Peter Lynch)	<i>Tricoryne elatior</i>
<i>Chloris truncata</i>	<i>Juncus bufonius</i>	

Old trees

The following table summarises the mature indigenous trees in the cemetery.

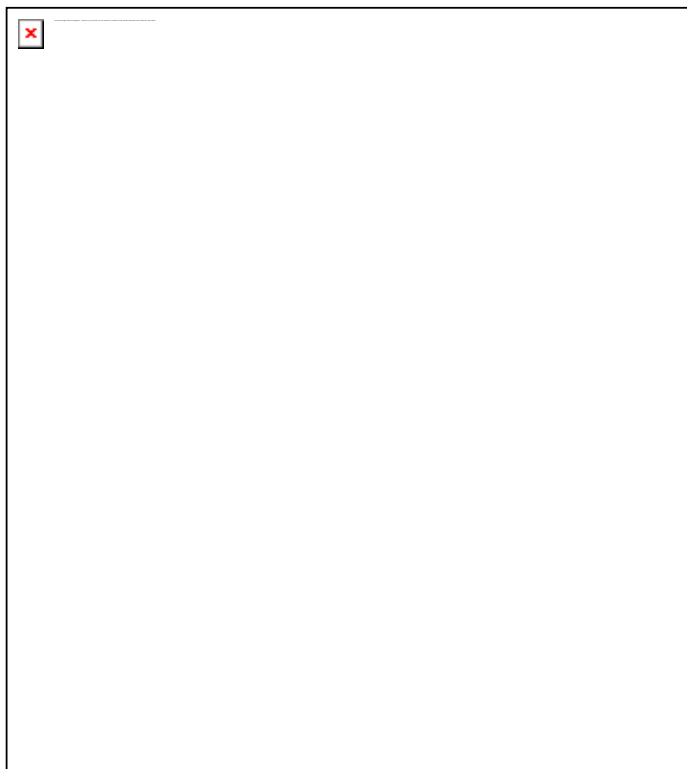
Number on aerial photograph	Species Name	Trunk diameter	Height	Health	Grave no.	Interment date
1	<i>Eucalyptus camaldulensis</i> (River Red Gum)	64 cm	15 m	Good	1661	Nov 1884
2	<i>Acacia implexa</i> (with <i>Acacia melanoxylon</i> , <i>Stipa scabra</i>)	50 cm		Good	815	April 1873
3	<i>Eucalyptus camaldulensis</i>	60 cm	13-14 m	Good	3291	Nov 1908
4	<i>Eucalyptus camaldulensis</i>	25 cm	7 m	Fair	586	Nov 1884
5	<i>Eucalyptus camaldulensis</i> with another smaller one, plus <i>Lomandra</i>	60 cm	14-15 m	Good	355, 356, 377, 378	April-Aug 1906
6	<i>Acacia melanoxylon</i> smothered with <i>Amyema quandang</i>	45 cm	12 m	Fair	1245	Sept 1891
7	<i>Eucalyptus camaldulensis</i>	32 cm	10 m	Fair – leaf skeletonisers	931, 958	Dec 1884, Feb 1885

The photograph at right corresponds to number 5 in the table above and on the aerial photograph (where the position and orientation of the scene are shown). This tree was chosen as representative of the eucalypts in the cemetery, and the photograph is intended to show the tree's structure, the luxuriance of the crown and the condition of the trunks.

Note that three of the five River Red Gums are on graves that were filled in the four months beginning November 1884, and the other two are on graves filled in 1906 and 1908. It is remarkable that all the mature River Red Gums in the cemetery occur on graves of such a narrow range of ages. The trunk diameters of trees 1, 3 and 5 are also quite uniform, suggesting similar age.

River Red Gums have a habit of synchronised germination, particularly following periods of flood. Monthly rainfall data from Kew meteorological station do not show that the periods of interest here stand out in history, but monthly averages do not reliably indicate shorter-term peaks that might cause floods. Daily data were not available.

Despite the absence of supporting meteorological data, it still seems likely that trees 1, 3 and 5 germinated not long after their respective graves were filled. This is consistent with the slightly wider trunk of the oldest tree.



A photograph of tree 5 from the table above, also shown on the aerial photograph.

One would then conclude that River Red Gums in this vicinity achieve a trunk diameter of approximately 60 cm at an age of 100 years. A corollary would be that River Red Gums around Boroondara must be considerably more than a century old to reach the Department of Sustainability & Environment's threshold diameter of 80 cm for a 'large old tree' in River Red Gum country.

The trees at Boroondara General Cemetery therefore fulfil a useful role in determining the age (and to some degree, the importance) of large old River Red Gums in the municipality. River Red Gums often do not produce discernible annual rings to allow simpler age determination.

Fauna of special significance

Conservation Status		Species Name	Last Record
Melbourne	Boroondara		
Rare	Endangered	Marbled Gecko	2005
-	Endangered	Spotted Pardalote	2004
-	Vulnerable	Eastern Rosella	2004

Full fauna list

The following species were observed during this study. The list is certain to be quite incomplete. Asterisks denote introduced species. The Red Wattlebird was the only species for which breeding was confirmed.

Birds		Reptiles
*Spotted Turtle-Dove	Noisy Miner	Marbled Gecko
Rainbow Lorikeet	Grey Butcherbird	
Eastern Rosella	Little Raven	Butterflies
Spotted Pardalote	*Common Blackbird	Australian Painted Lady
Red Wattlebird	*Common Myna	
Brush Wattlebird		

Fauna habitat

Native birds are fairly abundant in the cemetery's indigenous trees as well as the Australian native trees in the section labelled 'Native plant glade' on the aerial photograph. Many birds were seen crossing between this site and trees in the adjacent Victoria Park.

An unexpected observation of fauna habitat is that the locally endangered Marbled Gecko can be found in reasonable numbers, sheltering beneath the flower vessels on graves.

Site significance rating

Rare or threatened plants

The site supports the largest populations in Boroondara of the locally threatened plant species, *Chloris truncata* (Windmill Grass) and *Pseudognaphalium luteoalbum* (Jersey Cudweed). The populations of two other locally threatened plant species (the Rough Spear-grass *Stipa scabra* and the Grey Mistletoe *Amyema quandang*) are also viable, provided that future herbicide practices are not too severe for the former species. The presence of viable populations of any locally threatened plant species qualifies the site for **Local** significance according to BioSites criterion 3.1.5 of Amos (2004).

Threats

Herbicide use is the only significant threat to the cemetery's ecological values. The level of impact is high.

Priority actions

The only recommendation for this site is that herbicide be applied more judiciously. Training in plant identification would probably be necessary for whoever conducts weed control in the cemetery.

Seed collection

There are enough plants of *Chloris truncata* to allow collection of substantial amounts of seed, subject to constraints outlined in Section 4.3. Seed collection would have to be properly authorised and conducted in a manner that shows due consideration for the purpose of a cemetery.

Monitoring

The photograph of the River Red Gum two pages up is to serve the purpose of monitoring tree health. This would ideally happen during times of stress (e.g. drought) or at intervals of about five years (whichever comes first).

Updating the plant species list would serve to monitor the richness of indigenous plants in the cemetery. This would ideally be conducted every few years.

Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for a total of three hours and twenty minutes on 10/11/04 using this study's standard approach described in Section 2.3. This included:
 - Description of soil and the composition of the native vegetation;
 - Compilation of a list of indigenous plant species and environmental weeds;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- Verbal reports of flora and Marbled Geckos from Ken Duxbury, and of flora from Peter Lynch (both local naturalists);
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Acknowledgment

Thanks to Mr Guy Forristal, who manages the cemetery, for facilitating the site inspection, and to his assistant for looking up the first burial dates for graves supporting indigenous trees.

Thanks also to Messrs Peter Lynch and Ken Duxbury for their naturalist observations in the cemetery.

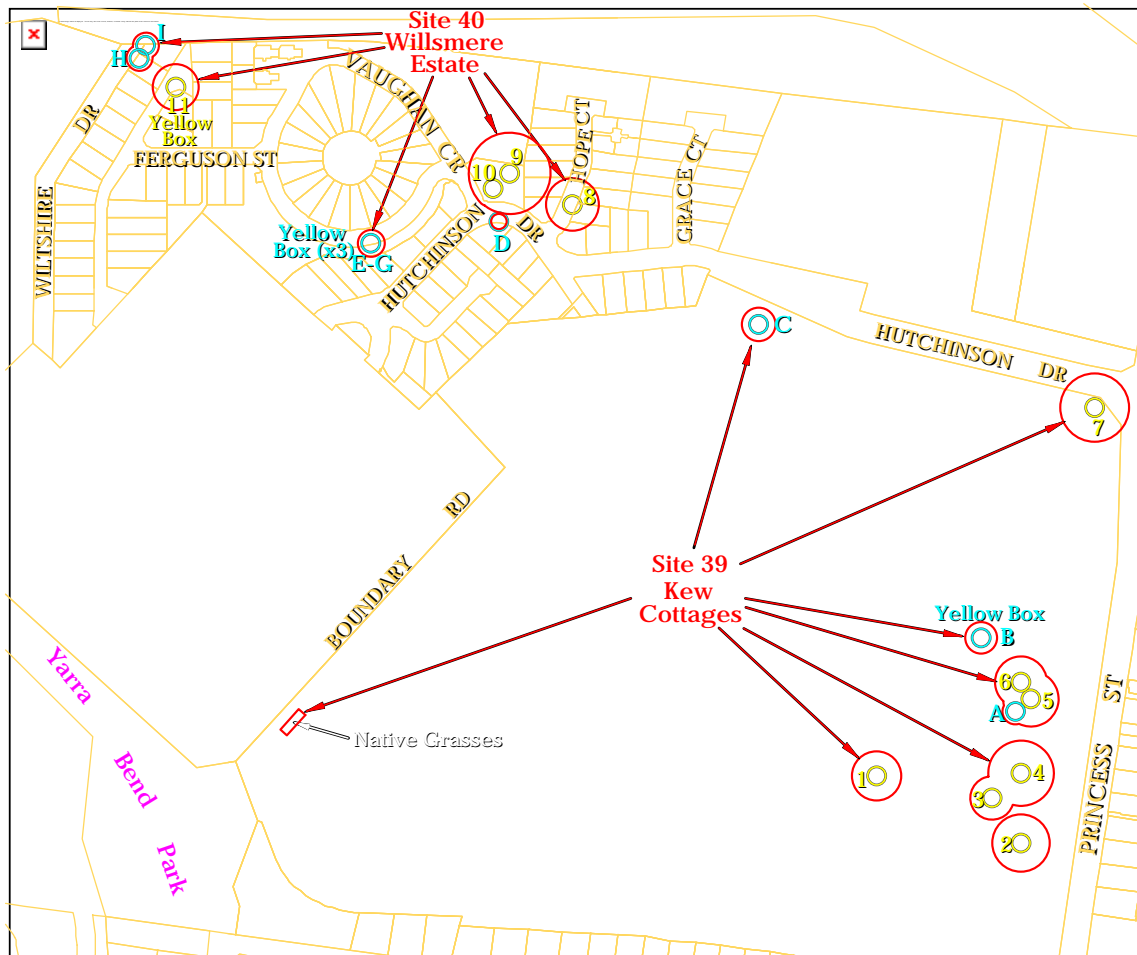
Site 39. Kew Cottages

Ten remnant eucalypts and a patch of native grassland on an embankment. Melway ref. 45 C3.

Site Biological Significance Level: *Local*

Summary of the most significant natural assets:

- One of Boroondara's largest Yellow Box trees (a locally vulnerable species) outside Yarra Bend Park;
- Seven large old River Red Gums;
- Two medium-sized River Red Gums.



LEGEND

○1 Numbered trees with trunk diam. >0.8 m
 ○A Letter-labelled trees with trunk diam. <0.8 m
 Trees shown are River Red Gums, unless labelled 'Yellow Box'.



Scale 1:5,500
 20 0 40 80 120 160 200 m

Boundaries

This site comprises eight disconnected sections within the grounds of the property commonly known as Kew Cottages, as labelled on the aerial photograph. Each circle or arc has a radius equal to eighteen times the trunk diameter of the tree at its centre, corresponding to Tree Protection Zones as recommended by Matheny and Clark (1998) for over-mature trees belonging to species that are sensitive to root disturbance. The rectangular section extends from the kerb of Boundary Rd to the top of the adjacent embankment, and lengthways to enclose all the native grasses on that embankment.

Land use & tenure

Government land, subject to a residential development proposal.

Physical features

Site area: 1.1 hectares, divided among seven sections.

Elevation: From 24 m in the northeastern corner of site to 61 m at the native grasses patch alongside Boundary Road.

Landform: Ridge top and upper slope of a ridge with moderate relief.

Slope: Typically 1:15, with aspects generally from north to north-northeast.

Soil type: Poorly consolidated sand in the rectangular patch of native grasses; shallow, light grey loam elsewhere.

Underlying geology: The rectangular patch of native grasses lies just within a deposit of Tertiary sands. The bedrock in the rest of the site is Silurian sandstone of the Dargile formation.

Site description

Kew Cottages retains some large specimens of pre-European River Red Gums (*Eucalyptus camaldulensis*), plus one Yellow Box (*Eucalyptus melliodora*). Most of them were documented (not entirely accurately) by Bryce Raworth in the 'Kew Cottages Conservation Management Plan' for the Victorian Department of Human Services in 2002. These trees, and some that were overlooked in the 2002 document, were assessed in the present study.

Seven of the River Red Gums qualify as large old trees according to the Department of Sustainability & Environment's criterion for woodlands dominated by Red Gums (i.e. trunk diameters of at least 0.8 m). These trees are each marked on the aerial photograph on page 355 with yellow circles and numbers. Their characteristics are tabulated below.

Tree number:	1	2	3	4	5	6	7
Trunk diameter:	106 cm	123 cm	93 cm	140 cm	118 cm	111 cm	147 cm
Health:	Fair	Very good	Good	Very good	Very good	Very good	Very good

In addition to the large old trees, the site has two other mature River Red Gums (labelled A and C on the aerial photograph), as well as a Yellow Box (labelled B) that is large by Boroondara's standards. The characteristics of these trees are tabulated below.

Tree label:	A (River Red Gum)	B (Yellow Box)	C (River Red Gum)
Trunk diameter:	55 cm	68 cm	70 cm (estimated)
Health:	Very good	Good	Very good

The trees show signs of having been well cared for, notwithstanding that Tree 1 has serious dieback and the trunk of Tree B (the Yellow Box) has minor borer damage. Photographs of all the trees, taken on 7th February 2005, appear on the following pages, to indicate the trees' structure, foliage density and trunk lesions.

In the process of visiting the site, the author incidentally noticed the rectangular patch of native grasses that is now included in the site. This is on a roadside embankment, and is dominated by various species of native wallaby-grasses, a spear-grass and Weeping Grass.

The author was not authorised to visit the whole of the Kew Cottages property, consistent with the project brief. Therefore, there is a slight chance that he may have missed something of biological significance.

Ecological links with other land

The habitat represented by the Kew Cottages site represents a very minor augmentation of habitat in the adjoining Yarra Bend Park. It does not provide any apparent ecological linkage to other habitat.

If native birds, bats or flying insects use the crowns or hollows of trees in the Kew Cottages site for nesting or roosting, those animals would probably seek food and other habitat needs in Yarra Bend Park. Native birds and flying insects that are resident in Yarra Bend Park, or that move along the Yarra River corridor, no doubt occasionally visit the trees and grasses in the Kew Cottages site. Insect-eating birds that undertake such movements could significantly improve the health of Kew Cottages' trees.

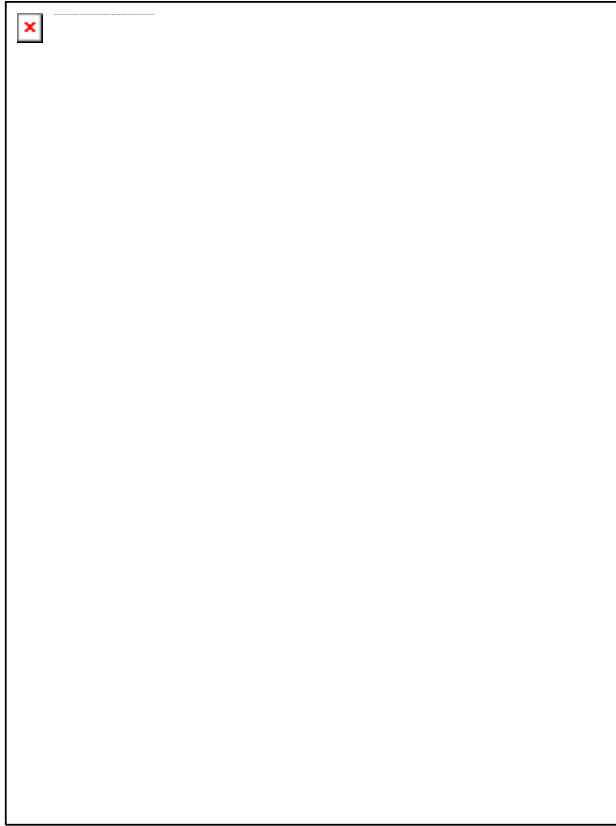
Former habitat types

Plains Grassy Woodland (EVC 55, **endangered** in the Gippsland Plain bioregion).

The remnant eucalypts of this site would once have been part of an area of Plains Grassy Woodland.

Grassy Woodland (EVC 175, **endangered** in the Gippsland Plain bioregion).

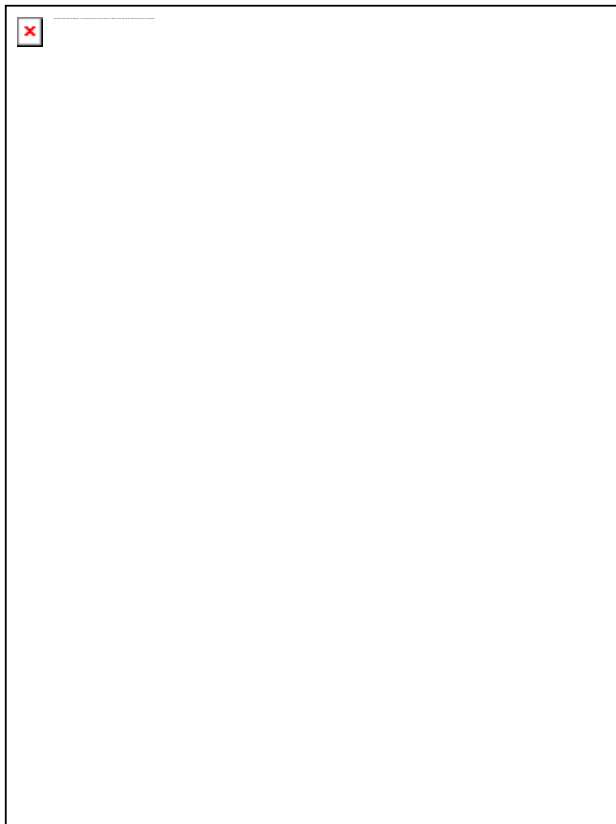
The rectangular patch of native grasses is a vestige of Grassy Woodland.



Site 39, Tree 1. Note the sparse crown and poor structure.



Site 39, Tree 2.



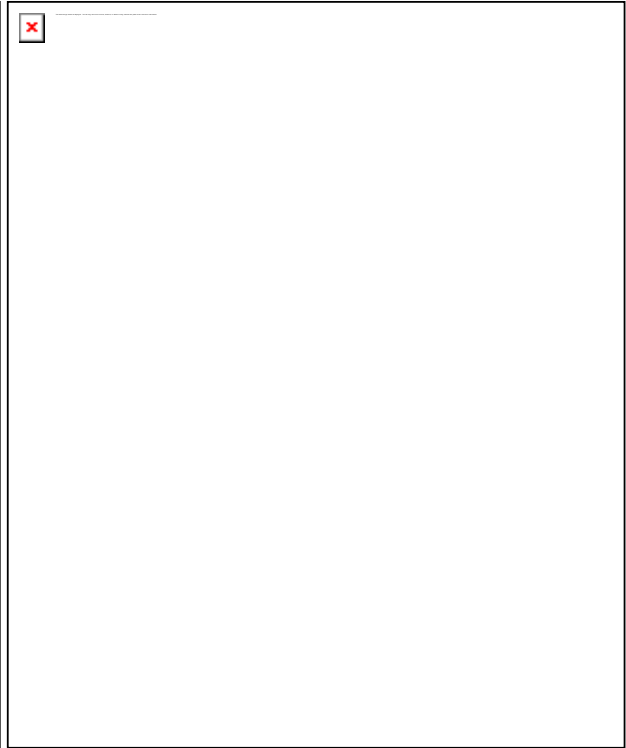
Site 39, Tree 3, with tree 4 in the background.



Site 39, Tree 4.



Site 39, Tree 7, near the corner of Princess St and Hutchinson Dr.



Site 39, Tree B – The Yellow Box.



Site 39, Trees 5, 6 and A.



Site 39, Tree C, photographed from Hutchinson Dr.

Flora of special significance

One significant plant species was found during the fieldwork for this study:

Conservation Status in Boroondara	Species Name	Notes
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Vulnerable *Eucalyptus melliodora* One individual – Tree B.

The conservation status rating, 'vulnerable', is explained in Section 2.5.2 (page 18).

Full flora list

The following is a full list of the indigenous flora species that were recorded at the Kew Cottages site.

Austrodanthonia fulva
Austrodanthonia racemosa
Austrodanthonia setacea

Austrostipa mollis
Eucalyptus camaldulensis
Eucalyptus melliodora

Microlaena stipoides
Weissia controversa

Fauna of special significance

The significant fauna species in the list below were observed at Kew Cottages by Chris Timewell in 2001. The conservation status ratings, 'vulnerable' and 'endangered', are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name
Endangered	Spotted Pardalote
Vulnerable	Laughing Kookaburra

Full fauna list

The list below was collected in 2001 by Chris Timewell and comes from the Atlas of Victorian Wildlife. It is not known whether the list is for Kew Cottages alone, or includes observations nearby.

Mammals	Birds	Spotted Pardalote	Little Raven
Common Brushtail Possum	Australian Wood Duck	Red Wattlebird	Welcome Swallow
Common Ringtail Possum	Silver Gull	Bell Miner	*Common Blackbird
	*Spotted Turtle-Dove	Noisy Miner	*Common Starling
	Rainbow Lorikeet	Willie Wagtail	*Common Myna
	Red-rumped Parrot	Australian Magpie	
	Laughing Kookaburra	Pied Currawong	

Site significance rating

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Rare or threatened plants

The site supports a large Yellow Box, which is a locally vulnerable species. It could be regarded as part of a larger population that grows in Yarra Bend Park (Site 11) and the Willsmere Estate (Site 40, see the aerial photograph on page 355), because pollen would be exchanged between these sites. On this basis, the Yellow Box at Kew Cottages is an outlier of a viable population of a locally vulnerable species, and therefore qualifies the site for **Local** significance according to BioSites criterion 3.1.5.

The BioSites criteria do not recognise any biological significance of isolated River Red Gums, regardless of their size. The Kew Cottages' River Red Gums are therefore not significant under the BioSites criteria. However, this should not be taken to imply that the centuries-old trees on the Kew Cottages have no value.

The rectangle of native grasses beside Boundary Rd also does not fit any of the BioSites criteria.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Eucalypt dieback disease due to possums, psyllids, leaf skeletonisers, leaf miners, borers, galls or other fauna.	Trees	Moderate	Current
Eucalypt dieback disease due to soil compaction (noting that cars daily park under Tree 4 and drive across the roots of Tree 3).	Trees	Moderate	Current
Residential development, for which concept plans have been prepared.	All	Moderate	Potential

Information sources used in this assessment

- A site inspection on 7th February 2005 using this study's standard approach described in Section 2.3.5, including a limited search for native vegetation, then mapping, measuring and photographing the trees and assessing their health;

- The '*Kew Cottages Conservation Management Plan*', prepared by Bryce Raworth in 2002 for the Victorian Department of Human Services;
- An inspection of the Department of Sustainability & Environment's flora and fauna databases, which yielded the bird records by Chris Timewell in 2001;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Acknowledgment

Thanks to the Victorian Department of Human Services, as well as the Kew Residential Services staff, for granting permission to inspect the property.

Site 40. Willsmere Estate, Kew

Ten remnant eucalypts, around which has been built a residential estate in recent years. Melway ref. 45 A3.

Site Biological Significance Level: *Local*

Summary of the most significant natural assets:

- Four Yellow Box trees (*Eucalyptus melliodora*), a vulnerable species in Boroondara. One of these qualifies as a large old tree, a rare occurrence for a Yellow Box in the Melbourne area;
- Three large old River Red Gums (*Eucalyptus camaldulensis*);
- Three smaller mature River Red Gums;

Aerial photograph

See page 355, which also covers the Kew Cottages site.

Boundaries

This site comprises six disconnected sections made up of circles surrounding remnant eucalypts, as shown on the aerial photograph on page 355 with red outlines and labels. The eucalypts are individually labelled on the aerial photograph with letters or numbers, depending on whether their trunk diameters are more or less than 80 cm (respectively). Each of the red circles around trees labelled 8, 9 and 11 has a radius equal to eighteen times the diameter of the central tree trunk, corresponding to Tree Protection Zones as recommended by Matheny and Clark (1998) for over-mature trees belonging to species that are sensitive to root disturbance. The tree protection zone for Tree 9 is so large as to envelope the one for Tree 10. The red circle around Trees E, F and G has a radius of 10.4 m, equal to eighteen times the trunk diameter of the largest tree of this trio (which is at the centre of the circle). The red circles around Trees H and I each have a radius of ten metres, which is regarded here as a reasonable Tree Protection Zone in the absence of permission to enter the private properties and measure the trunk diameters. Tree D is smaller and probably more robust than the older River Red Gums, and a radius of five metres has been used for its surrounding red circle.

Land use & tenure

Nature strips and a park managed by the City of Boroondara.

Physical features

Site area: 0.6 hectares total.

Elevation: 32 m to 39 m.

Landform: Upper slope of a ridge.

Slope: The natural terrain has an average gradient of 1:12, with a generally northerly to north-northeasterly aspect. The three Yellow Box trees on the southern side of Vaughan Crescent are located on a north-facing batter with a gradient of 1:3.

Soil type: Shallow, light grey loam.

Underlying geology: Silurian sandstone of the Dargile formation.

Site description

The only indigenous plants found in this site were six River Red Gums (*Eucalyptus camaldulensis*) and four Yellow Box (*Eucalyptus melliodora*) trees, around which has been constructed a residential development within the past decade.

Three of the site's River Red Gums and one Yellow Box qualify as large old trees according to the Department of Sustainability & Environment's criterion for woodlands dominated by Red Gums (i.e. trunk diameters of at least 0.8 m). These trees are each indicated by a yellow circle and number on the aerial photograph on page 355. Tree 11 is the largest Yellow Box measured in this study, anywhere in Boroondara. The trees' characteristics are tabulated below.

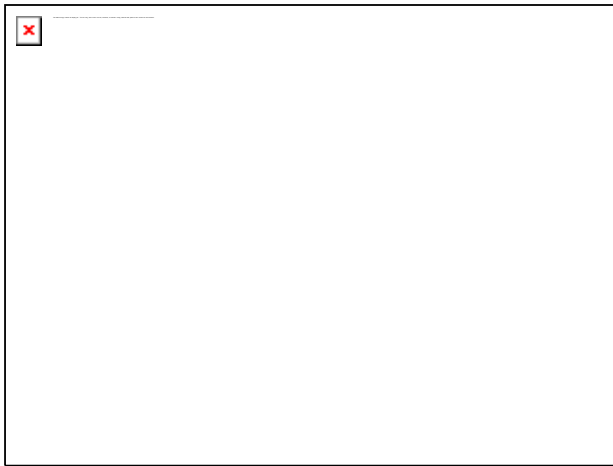
Tree number:	8	9	10	11
Species:	River Red Gum			Yellow Box
Trunk diameter:	113 cm	175 cm	82 cm	99 cm
Health:	Good	Good	Very good	Good

In addition to the large old trees, the site has six other mature eucalypts (labelled D to I on the aerial photograph). The characteristics of these trees are tabulated below.

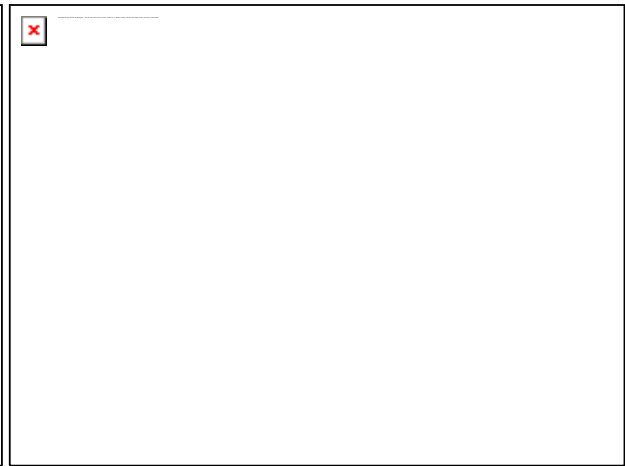
Tree label:	D	E	F	G	H	I
Species:	River Red Gum	Yellow Box			River Red Gum	
Trunk diameter:	small – not measured	58 cm	c. 30 cm	c. 20 cm	not measured*	not measured*
Health:	Very good	Very good	Very good	Very good	Very good	Very good

* Trees H and I are on private property, and permission was not sought to measure these trees.

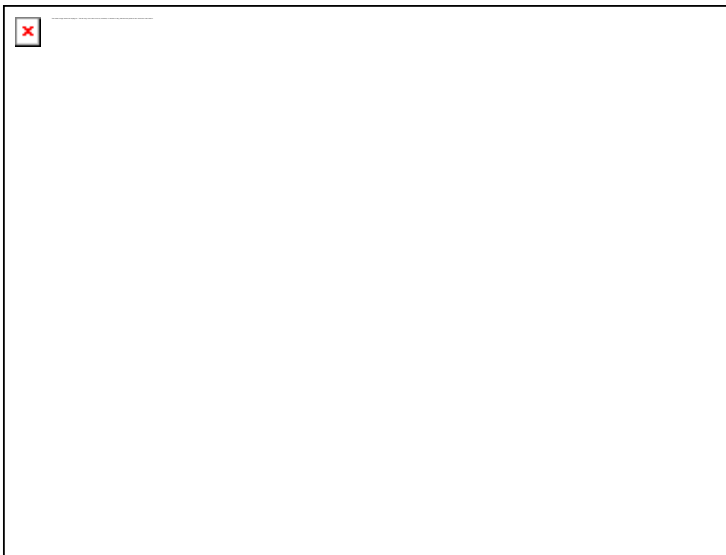
The trees show signs of having been well cared for. Trees 8 and 9 have visible hollows suitable for occupation by native birds or bats, and there may be hollows in other trees even though they could not be seen from the ground. Photographs of all the trees appear below, to show the structure and foliage density of the trees.



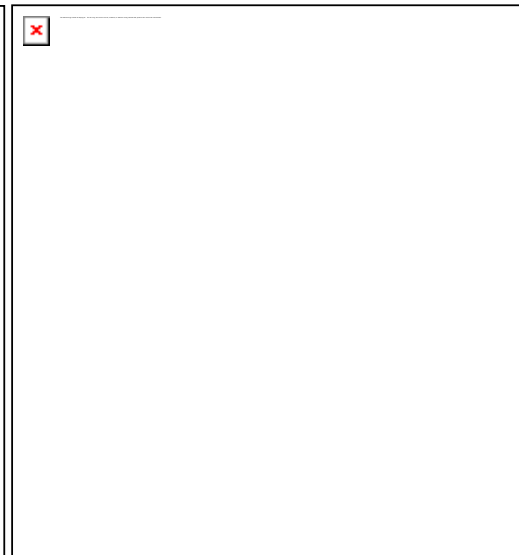
Site 40, Tree 8, outside 6 Hope Ct.



Site 40, Tree 10 (right, middle distance) and **Tree 9** (left, background).



Site 40, Tree 11, a large Yellow Box outside 4 O'Brien Ct.



Site 40, Trees E, F and G (Yellow Boxes). Tree E is being measured, Tree G is immediately to its right, and Tree F is c. 2 m further to the right.



Site 40, Trees H and I (the tall trees behind the fence, in two private properties).

Ecological links with other land

The trees in the Willsmere Estate site represent a minor augmentation of habitat in the adjoining Yarra Bend Park. The trees may also represent ecological 'stepping-stones' for some birds and flying insects moving between Yarra Bend Park and the Kew Cottages site. Such fauna movements would be of minor benefit to the fauna, but the benefit to the health of the trees from visitation by insect-eating birds could be significant.

If native birds, bats or flying insects use the crowns or hollows of trees in the Willsmere Estate site for nesting or roosting, those animals would be expected to seek food and other habitat needs in Yarra Bend Park.

Former habitat types

Plains Grassy Woodland (EVC 55, **endangered** in the Gippsland Plain bioregion).

The remnant eucalypts of this site would once have been part of an area of Plains Grassy Woodland.

Flora of special significance

One significant plant species was found during the fieldwork for this study:

Conservation Status in Boroondara	Species Name	Notes
Vulnerable	<i>Eucalyptus melliodora</i>	Four individuals (Trees 11, E, F and G).

The conservation status rating, 'vulnerable', is explained in Section 2.5.2 (page 18).

Site significance rating

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Rare or threatened plants

The site supports four individuals of the locally vulnerable Yellow Box, one of which is a large old tree. These trees are part of a larger, viable population that grows mainly in the adjoining Yarra Bend Park (Site 11), and pollen would be exchanged between these sites. A viable population of a locally vulnerable species qualifies the site for **Local** significance according to BioSites criterion 3.1.5.

The BioSites criteria do not recognise any biological significance of isolated River Red Gums, regardless of their size. The Willsmere Estate's River Red Gums are therefore not significant under the BioSites criteria. However, this should not be taken to imply that these centuries-old trees are not significant when considered against criteria related to heritage or aesthetics.

Threats

The following threat to the site's ecological values is presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Eucalypt dieback disease due to possums, psyllids, leaf skeletonisers, leaf miners, borers, galls or other causes.	Trees	Moderate	Potential

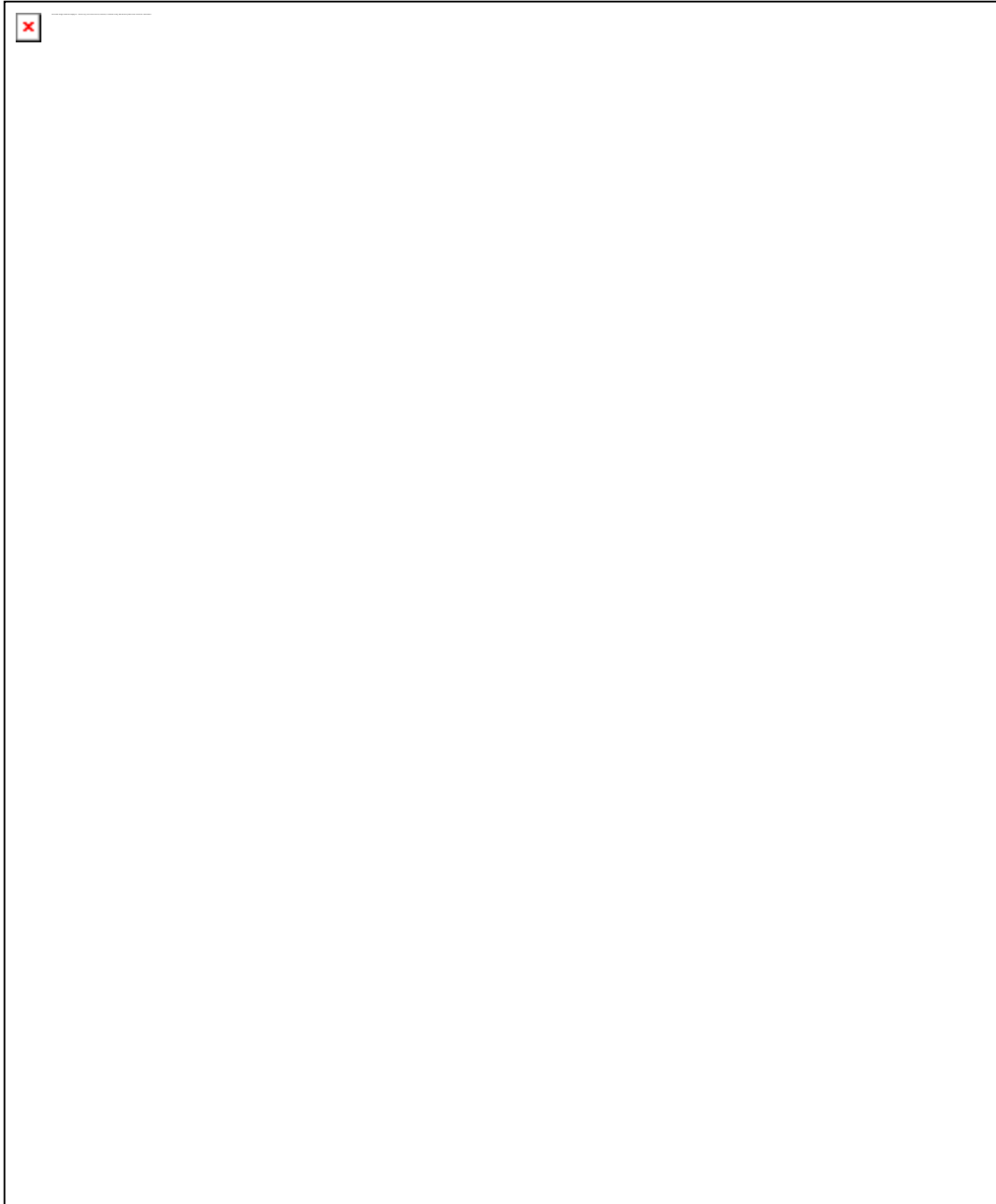
Information sources used in this assessment

- A site inspection on 7th February 2005 using this study's standard approach described in Section 2.3.5, including a search for native vegetation in the area, then mapping, measuring and photographing the trees and assessing their health;
- An inspection of the Department of Sustainability & Environment's fauna and BioSites databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Site 41. River Red Gum at 83 Walpole St, Kew

One very large River Red Gum on a residential allotment. Melway ref. 45 C4.

Site Biological Significance Level: *Below the BioSites Rating Threshold*



Site 41. The River Red Gum at 83 Walpole St, Kew.

Boundaries

This site is taken to be a circle of radius 28 metres centred on the trunk of the prominent River Red Gum depicted in the photograph above, which is located at the southeast corner of 83 Walpole St, Kew. The radius of 27 metres is eighteen times the trunk diameter, corresponding to the Tree Protection Zone recommended by Matheny and Clark (1998) for over-mature trees belonging to species that are sensitive to root disturbance.

Land use & tenure: The tree is on private property but the site extends across the road and into adjoining properties.

Physical features of the land

Site area: 616 m²

Elevation: 54 metres

Landform: Upper slope of a ridge with low relief.

Slope: 1:15 with a northerly aspect.

Soil type: The soil is probably a grey sand over a mottled clay subsoil.

Underlying geology: The site is almost on the edge of the cap of Tertiary 'Red Bluff' sand that covers the ridge top. The Tertiary sand is therefore likely to be shallow. Beneath the Tertiary sand lies the sandstones of the Dargile formation, which is Silurian.

Tree description

The tree in this site is listed as Tree 99 in the 'City of Boroondara Significant Tree Study' by John Patrick Pty Ltd (2001). It has a trunk diameter of 1.57 m and a height of 20 m (measured by clinometer). The tree is in good health and the structure appears stable when viewed from outside the property, notwithstanding that the tree has three leaders from near the base. It is being well cared for, although the Significant Tree Study report mentions that the tree is at risk from pruning of limbs overhanging the road and the neighbouring property to the south.

Ecological links with other land

This site is rather ecologically isolated from other sites with native vegetation. The closest native vegetation is in the Kew Cottages site (Site 39), approximately 250m to the west. Some native birds, flying insects and perhaps bats may fly between these two sites, but this is of little ecological importance.

Habitat type

The River Red Gum would once have been located almost on the interface, or 'ecotone', between Plains Grassy Woodland (EVC 55) to the north and Grassy Woodland (EVC 175) to the south.

Site significance rating

The BioSites criteria of the Department of Sustainability & Environment (Amos 2004) do not recognise any biological significance of isolated River Red Gums, regardless of their size. This site therefore has a rating of 'Not significant' by the BioSites criteria.

This should not be taken to imply that this centuries-old tree is not significant when considered against criteria related to heritage or aesthetics.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as the one of interest here. However, the latest version states, '*Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats*'. The last sentence is not correct in the context of 83 Walpole St, Kew, or Boroondara more generally.

Information sources used in this assessment

- A site inspection on 29th November 2004 using this study's standard approach for scattered trees described in Section 2.3.5;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Site 42. River Red Gum at 10-12 Gellibrand St, Kew

One very large River Red Gum on the boundary between two residential allotments and their footpath.
Melway ref. 45 C7.

Site Biological Significance Level: *Below the BioSites Rating Threshold*

Aerial photograph

See page 369, which also covers Site 43.

Boundaries

This site is taken to be circle of radius 27 metres centred on the trunk of the prominent River Red Gum at the junction of 10 and 12 Gellibrand St, Kew, next to the footpath along the street. The radius of 27 metres is eighteen times the estimated trunk diameter, corresponding to the Tree Protection Zone recommended by Matheny and Clark (1998) for over-mature trees belonging to species that are sensitive to root disturbance.

Land use & tenure: The tree is on private property but the site extends across the road and into adjoining properties.

Physical features of the land

Site area: 573 m²

Elevation: 53 metres

Landform: Mid-slope of a ridge with low relief.

Slope: 1:14 with a westerly aspect.

Soil type: Light grey loam over a yellow-brown mottled clay subsoil.

Underlying geology: Sandstones of the Dargile formation, which is Silurian.

Tree description

The tree in this site has a trunk diameter of approximately 1.5 m (estimated from the footpath) and a height of 18-20 m (measured by clinometer). The tree appears to be in very good health when viewed from outside the property.

Ecological links with other land

The tree is quite ecologically isolated, because the only other remnant trees within one kilometre are:

- Two large old River Red Gums in Xavier College (Site 43), 275 m to the south; and
- A group of somewhat smaller River Red Gums around the car park of the VicRoads headquarters, 250-300 m to the west-southwest.

Habitat type

The River Red Gum would once have been within an area of Plains Grassy Woodland (EVC 55).

Site significance rating

The BioSites criteria of the Department of Sustainability & Environment (Amos 2004) do not recognise any biological significance of isolated River Red Gums, regardless of their size. This site therefore has a rating of 'Not significant' by the BioSites criteria.

This should not be taken to imply that this centuries-old tree is not significant when considered against criteria related to heritage or aesthetics.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as the one of interest here. However, the latest version states, '*Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats*'. The last sentence is not correct in the context of the site of interest here, or Boroondara more generally.

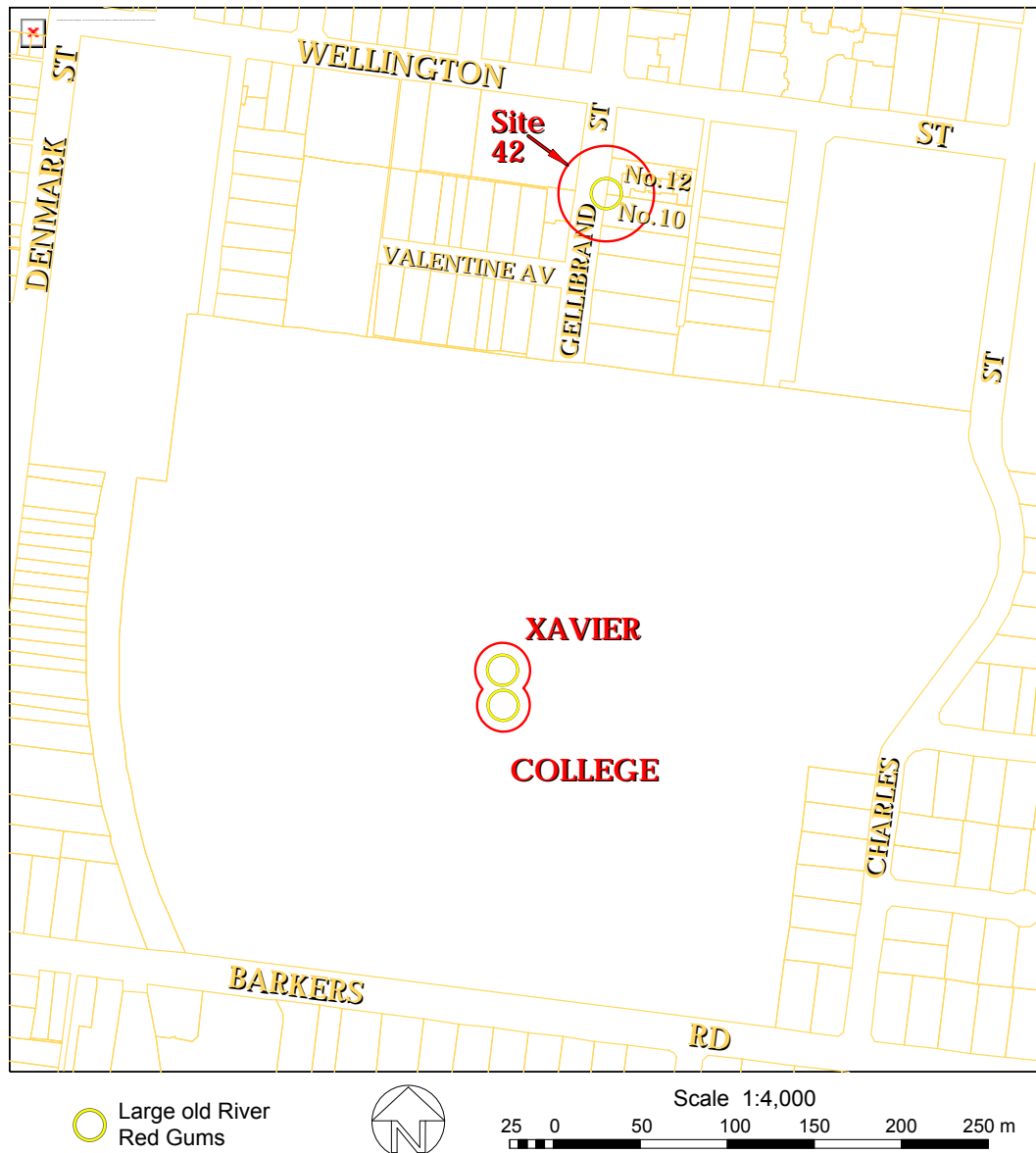
Information sources used in this assessment

- A site inspection on 14th January 2005 using this study's standard approach for scattered trees described in Section 2.3.5;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Site 43. Xavier College, Kew

Two large old River Red Gums beside driveways through the school. Melway ref. 45 C7.

Site Biological Significance Level: *Below the BioSites Rating Threshold*



Boundaries

This site is outlined in red on the aerial photograph above, amid the ovals of Xavier College. The boundary represents the union of two overlapping circles centred on the trees of interest. The arc radius of the site boundary around the more northerly tree is 15.8m, and the radius around the other tree is 15.1m. These radii are eighteen times the diameters of the associated tree trunks, as recommended by Matheny and Clark (1998) for Tree Protection Zones around over-mature trees belonging to species that are sensitive to root disturbance.

Land use & tenure

Grounds of a private school.

Physical features of the land

Site area: 0.13 hectares

Elevation: 45 m

Landform: Mid-slope on a ridge of low relief.

Slope: Slight, with a west-southwesterly aspect.

Soil type: Light grey loam over a yellow-brown mottled clay subsoil.

Underlying geology: Sandstones of the Dargile formation, which is Silurian.

Tree description

The site's two remnant eucalypts are both River Red Gums (*Eucalyptus camaldulensis*), and both qualify as large old trees according to the criteria of the Department of Sustainability & Environment for woodlands dominated by Red Gums. The more northerly tree is beside an oval, at the top of a batter beside a driveway through the school. The other tree is on level ground on the opposite side of the driveway, in a traffic island. The trees may be centuries old, and appear to have been well cared for in recent years. Their basic characteristics are tabulated below.

Tree	Trunk diameter	Height	Health
Northern, beside the oval	88 cm	13-14 m	Very good
Southern, in the traffic island	84 cm	15 m	Very good

Ecological links with other land

This site is quite ecologically disconnected from other sites with native vegetation. The only other remnant trees within 800 metres are:

- A single large old River Red Gum at 10-12 Gellibrand St, Kew (Site 42), 275 m to the north; and
- A group of somewhat smaller River Red Gums around the car park of the VicRoads headquarters, 250 m to the northwest.

Habitat type

The trees in this site would once have been within a stand of Plains Grassy Woodland (EVC 55).

Bird list

Only common urban birds were observed during the author's brief inspection of the site, which is what one would expect for such a site. The list below was compiled, with asterisks to indicate introduced species.

Masked Lapwing	Noisy Miner	Australian Magpie	*Common Myna
*Spotted Turtle-Dove	Magpie-lark	Little Raven	
Rainbow Lorikeet	Willie Wagtail	*Common Starling	

Site significance rating

The BioSites criteria of the Department of Sustainability & Environment (Amos 2004) do not recognise any biological significance of individual River Red Gums, regardless of their size. Xavier College therefore has a rating of 'Not significant' by the BioSites criteria.

This should not be taken to imply that the school's two large old River Red Gums have no value.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as the ones of interest here. However, the latest version states, '*Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats*'. The last sentence is not correct in the context of Xavier College, or Boroondara more generally.

Information sources used in this assessment

- A site inspection of one hour on 14th January 2005 using this study's standard approach for scattered trees described in Section 2.3.5, including a search for any native vegetation. (Only the two River Red Gums and some of the hardy native grass, *Austrodanthonia racemosa*, were found.);
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Acknowledgment

Thanks to Xavier College for granting permission to inspect the school grounds.

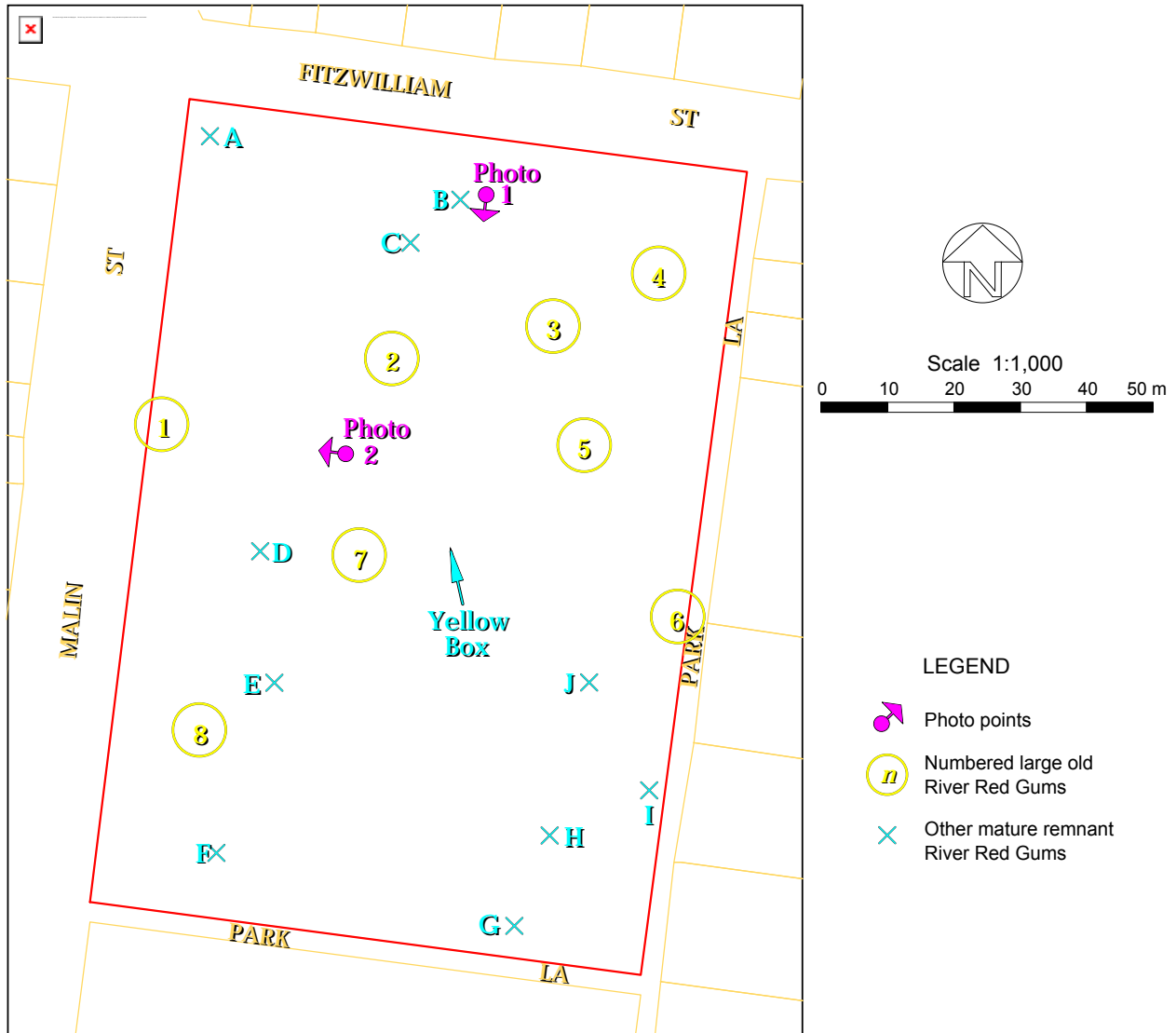
Site 44. Kellett Reserve, Kew

Nineteen remnant eucalypts in a small amenity park. Melway ref. 45 F8.

Site Biological Significance Level: *Below the BioSites Rating Threshold*

Summary of the most significant natural assets:

- One of Boroondara's largest Yellow Box trees (a locally vulnerable species) outside Yarra Bend Park;
- Eight large old River Red Gums;
- Ten smaller River Red Gums.



Boundaries

This site is the whole of Kellett Reserve, as outlined in red above.

Land use & tenure

Council amenity park with a playground.

Physical features

Site area: 1.0 hectares

Elevation: 54 m to 60 m.

Landform: Mid-slope of a ridge with low relief.

Slope: West facing slope with gradient of 1:14.

Soil type: Grey sandy topsoil over brownish mottled clay subsoil (based on geological survey maps).

Underlying geology: The site is on the edge of a Tertiary deposit of sands known as the Red Bluff sands. Being on the edge of this deposit, the layer is probably shallow. Beneath it is Silurian sandstone of the Dargile formation.

Tree descriptions

Kellett Reserve is dominated by large specimens of pre-European River Red Gums (*Eucalyptus camaldulensis*), plus one Yellow Box (*Eucalyptus melliodora*). There are also some River Red Gums that post-date settlement, and some planted exotic trees. Apart from the eucalypts, the only indigenous plant species found in the reserve was Creeping Mistletoe (*Muellerina eucalyptoides*), which grows on six of the eucalypts. (The Pigweed, *Portulaca oleracea*, was also found, but it is probably not indigenous to Kew.)

Photographs 1 and 2 on the next page provide representative views of the reserve and its trees, taken on 11th February 2005. The locations and orientations of the camera are marked on the aerial photograph on page 372. Note the trees' structure and foliage density in the photographs.

The Yellow Box is the only species of biological significance in Kellett Reserve. It is marked on the aerial photograph and can be seen in Photo 1, in the background just right of centre. The diameter of the trunk is 70 cm and the tree's health is good.

Eight of the River Red Gums qualify as large old trees according to the Department of Sustainability & Environment's criterion for woodlands dominated by Red Gums (i.e. trunk diameters of at least 0.8 m). These trees are each marked on the aerial photograph with yellow circles and numbers. Their characteristics are tabulated below.

Tree number:	1	2	3	4	5	6	7	8
Trunk diameter:	120 cm	108 cm	92 cm	95 cm	108 cm	88 cm	107 cm	101 cm
Health:	Good	Good	Fair-good	Good	Good	Good	Good	Good

In addition to the large old trees, there are ten other mature River Red Gums, labelled A to J on the aerial photograph. The characteristics of these trees are tabulated below.

Tree label:	A	B	C	D	E	F	G	H	I	J
Trunk diameter:	63 cm	32 cm	71 cm	62 cm	61 cm	78 cm	63 cm	65 cm	64 cm	33 cm
Health:	Fair-good	Fair	Fair-good	Fair	Fair	Fair	Good	Good	Poor-fair	Good

The larger trees show signs of having been generally well cared for and have survived the recent drought well. The smaller trees are in poorer condition and in need of an arboricultural assessment with a view to restoring their health. In particular, the amount of mistletoe on some of the trees may put some trees at risk.

Ecological links with other land

Kellett Reserve is quite ecologically isolated from other potential habitat for native flora or fauna. There are few if any remnant trees within one kilometre.

Former habitat type

Kellett Reserve would once have been part of a stand of Grassy Woodland (EVC 175).

Flora of special significance

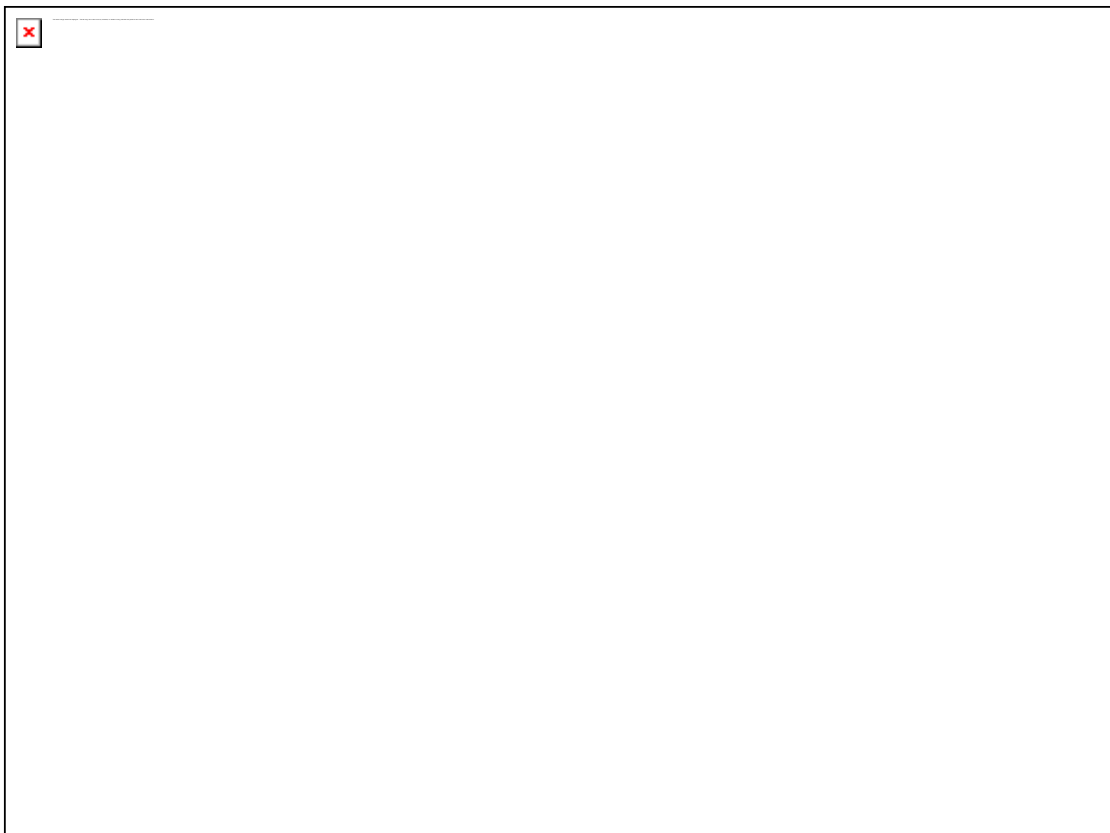
One significant plant species was found:

Conservation Status in Boroondara	Species Name	Notes
Vulnerable	<i>Eucalyptus melliodora</i>	One individual, marked on the aerial photograph on page 372.

The conservation status rating, 'vulnerable', is explained in Section 2.5.2 (page 18).



Site 44, Photo 1. A southerly view through the park, showing six of its large old River Red Gums and the Yellow Box.



Site 44, Photo 2. Kellett Reserve's largest old River Red Gum (Tree 1), whose health was rated as good.

Site significance rating

The site supports one of Boroondara's largest specimens of Yellow Box, which is a locally vulnerable species. However, a single tree does not represent a viable population, and therefore does not qualify the site for Local significance under BioSites criterion 3.1.5.

The BioSites criteria do not recognise any biological significance of River Red Gums without any native understorey, regardless of the trees' size.

Kellett Reserve is therefore not significant under the BioSites criteria, but this should not be taken to imply that its centuries-old trees are not significant when considered against criteria related to heritage or aesthetics.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Eucalypt dieback disease due to possums, psyllids, leaf skeletonisers, leaf miners, borers, galls, drought stress or other causes.	Trees	Moderate	Current

Recommendations

- If there has been no recent arboricultural assessment of the reserve's remnant eucalypts, one should be obtained with a view to restoring the trees' health. In particular, the amount of mistletoe on some of the trees may put some trees at risk.
- During periods of drought, the remnant eucalypts should be inspected each summer to check whether irrigation is necessary to avoid deaths.

Information sources used in this assessment

- A site inspection on 11th February 2005 using this study's standard approach described in Section 2.3.5, including a search for native vegetation, then mapping, measuring and photographing the trees and assessing their health;
- An inspection of the Department of Sustainability & Environment's fauna and BioSites databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

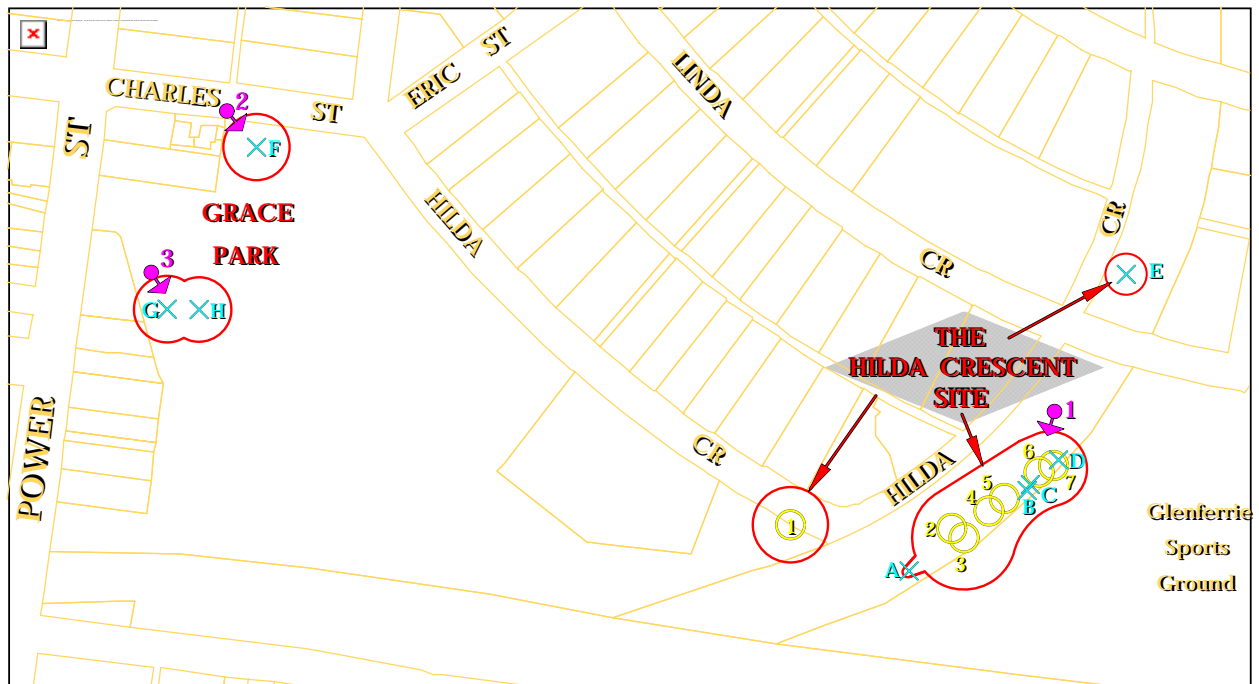
Site 45. Hilda Crescent, Hawthorn

Eleven remnant River Red Gums within car parks, and another growing as a street tree. Melway ref. 45 C10.

Site Biological Significance Level: *Below the BioSites Rating Threshold*

Summary of the most significant natural assets:

- Seven large old River Red Gums;
- Five smaller River Red Gums.



Scale 1:3,000

10 0 20 40 60 80 100 m

LEGEND



Numbered trees with trunk diam. >0.8 m



Letter-labelled trees with trunk diam. <0.8 m



Photo point

Boundaries

This site has three disconnected segments, as labelled and outlined in red in the right-hand half of the aerial photograph above. (The two red outlines in the left-hand half form Site 46.) The two circular segments of the Hilda Crescent site are centred on River Red Gums and have radii of 15.9 m and 8.7 m, which have been calculated in proportion to the associated trunk diameters as recommended by Matheny and Clark (1998) for Tree Protection Zones around species that are sensitive to root disturbance. The larger shape was obtained by enveloping circles around all the enclosed trees, each circle with a radius based on the same formula of Matheny and Clark. The southwestern tip is an exception: a circle was drawn to enclose the drip line of a sapling River Red Gum, and this was linked with straight lines to the group of older trees.

Land use & tenure

The westernmost tree is effectively a street tree. The remainder of the site is dominated by asphalt car parks, with a mulched garden bed through the middle of the largest segment.

Physical features

Site area: 0.38 hectares

Elevation: 20 m to 28 m

Landform: Floor of a shallow valley.

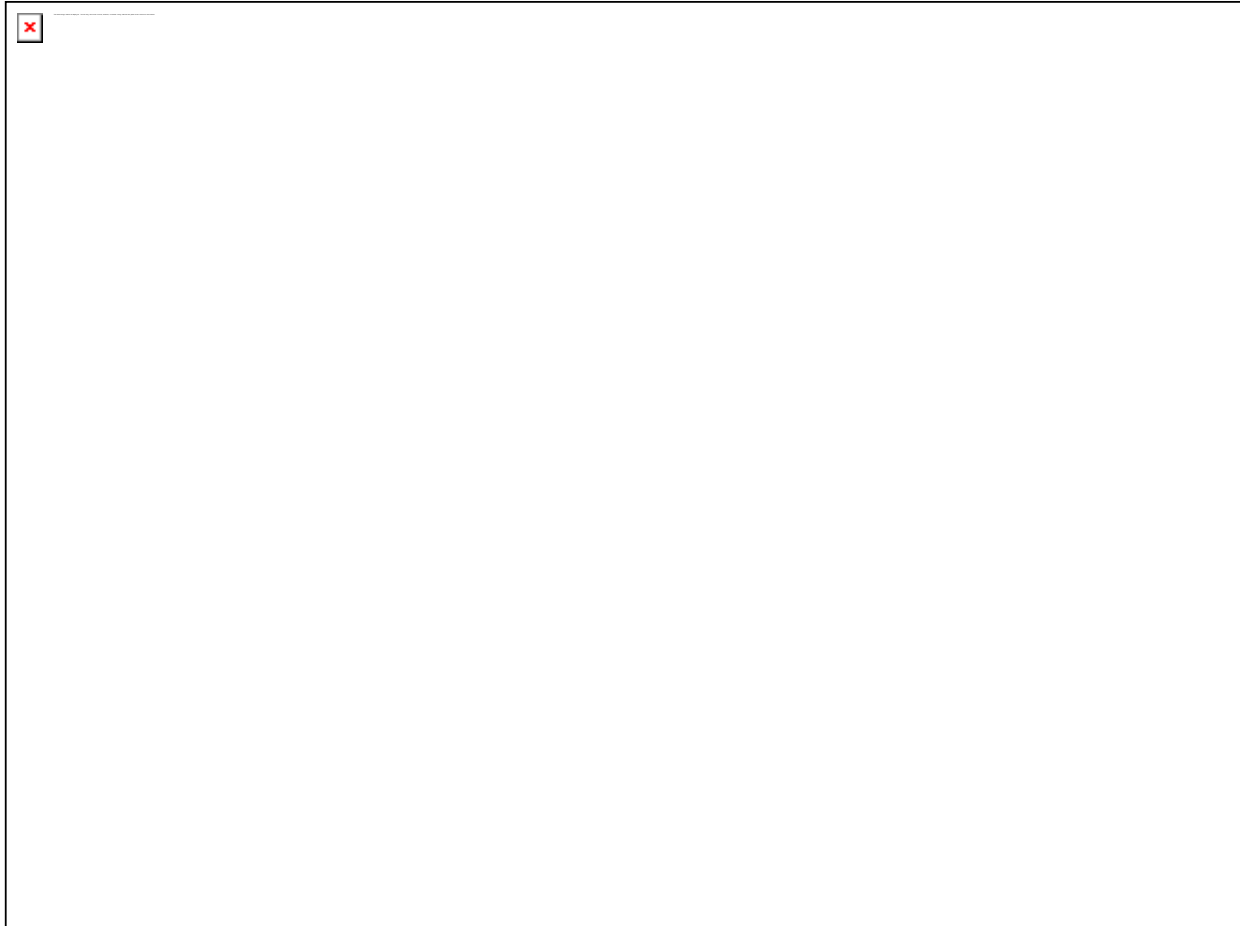
Slope: Typically 1:20, with a southwesterly aspect.

Soil type: The natural soil is alluvium. Earth works may have altered the soil in places.

Underlying geology: Beneath the alluvium, the bedrock is Silurian sandstone of the Dargile formation.

Tree descriptions

The only indigenous vegetation that was found in this site comprised the eleven River Red Gums (*Eucalyptus camaldulensis*) that are individually marked on the aerial photograph on the previous page, along with some Creeping Mistletoe (*Muellerina eucalyptoides*) growing on Tree D. Most of the trees are visible in the photograph below, which was taken on 11/2/05 from the location marked as photo point 1 on the aerial photograph.



A southerly view through the largest segment of Site 45, to show the foliage density of trees in the site.
The small tree at far left is Tree D; the one in the middle of the field of view is Tree 6.

All but one of the trees would once have been beside a creek that has since been filled in. The exception is the tree labelled E, which would have been further up the valley slope.

Seven of the River Red Gums qualify as large old trees according to the Department of Sustainability & Environment's criterion for woodlands dominated by Red Gums (i.e. trunk diameters of at least 0.8 m). These trees are each marked on the aerial photograph with yellow circles and numbers. They may well predate European settlement. Their characteristics are tabulated below.

Tree number:	1	2	3	4	5	6	7
Trunk diameter:	88 cm	90 cm	122 cm	81 cm	84 cm	86 cm	88 cm
Health:	Good	Fair-good	Good	Good to very good	Good	Good	Good

In addition to the large old trees, there are five other River Red Gums, labelled A to E on the aerial photograph. The characteristics of these trees are tabulated below.

Tree label:	A	B	C	D	E
Trunk diameter:	sapling	57 cm	76 cm	32 cm	58 cm
Health:	Good	Good	Good	Fair	Very good

Tree D's health may improve if its burden of mistletoe were to be reduced. Arboricultural advice should be sought on this matter.

Ecological links with other land

This site is quite ecologically isolated from any substantial areas of habitat for native flora or fauna. The nearest indigenous trees are:

- A Blackwood (*Acacia melanoxylon*) in fair health, approximately 10 m tall, growing beside the railway line, due south of Tree A; and
- The three Yellow Gums (*Eucalyptus leucoxylon*) in Grace Park that are marked on the aerial photograph on page 376, although there is some doubt as to whether they are natural or have been planted.

There are also non-indigenous eucalypts along Hilda St and in the neighbourhood generally. These trees augment the food source that the remnant trees provide for native birds and insects.

Former habitat type

This site would once have been within a stand of Creekline Grassy Woodland (EVC 68).

Site significance rating

The BioSites criteria of the Department of Sustainability & Environment (Amos 2004) do not recognise any biological significance of River Red Gums without any understorey, regardless of the trees' size. The Hilda Crescent site therefore has a rating of 'Not significant' by the BioSites criteria.

This should not be taken to imply that trees such as these, some of which probably pre-date European settlement, have no value.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as those of interest here. However, the latest version states, '*Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats*'. The last sentence is not correct in the context of Hilda Crescent, or Boroondara more generally.

Recommendation

- If there has been no recent arboricultural assessment of the site's remnant eucalypts, one should be obtained for trees labelled 2 and D with a view to restoring those trees' health. In particular, the amount of mistletoe on Tree D may need to be reduced.

Information sources used in this assessment

- A site inspection on 11th February 2005 using this study's standard approach described in Section 2.3.5, including a search for native vegetation, then mapping, measuring and photographing the trees and assessing their health;
- An inspection of the Department of Sustainability & Environment's fauna and BioSites databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Site 46. Grace Park's Yellow Gums, Hawthorn

Three Yellow Gums (*Eucalyptus leucoxylon*) in a park. Melway ref. 45 B9.

Site Biological Significance Level: *State* (tentatively)

Summary of the most significant natural assets:

- Three Yellow Gums which, if established to be indigenous, represent a population of an endemic Victorian species that is listed as vulnerable.

Aerial photograph

See page 376, which also covers the neighbouring Hilda Crescent site.

Boundaries

This site has two disconnected segments, as labelled and outlined in red in the left-hand half of the aerial photograph. The boundaries derive from circles centred on the park's three Yellow Gums (*Eucalyptus leucoxylon*), each circle with a radius that is eighteen times the diameter of the associated trunk (tabulated below). The factor of eighteen is recommended by Matheny and Clark (1998) for Tree Protection Zones around over-mature trees belonging to species that are sensitive to root disturbance.

Land use & tenure

Council park.

Physical features

Site area: 0.16 hectares

Elevation: 16 m to 18 m

Landform: Bank of a perennial creek in a very shallow valley.

Slope: Typically 1:24, with a southwesterly aspect.

Soil type: The natural soil is alluvium, but earth works may have altered the soil.

Underlying geology: Beneath the alluvium, the bedrock is Silurian sandstone of the Dargile formation.

Tree descriptions

This site's three Yellow Gums are labelled F, G and H on the aerial photograph. (Trees A-E are in Site 45.) It is not yet clear whether the Yellow Gums are natural or not. Their sizes (trunk diameters to 78 cm) indicate that if they have been planted, they would have been among the earliest plantings of Australian species in Melbourne. Efforts to establish the trees' status with more confidence are continuing.

Tree F is depicted in Photo 1 on the next page, and Trees G and H are depicted in Photo 2. There are signs of recent lopping on Tree G, which may further benefit from a collar to prevent browsing by possums.

The characteristics of the trees are tabulated below:

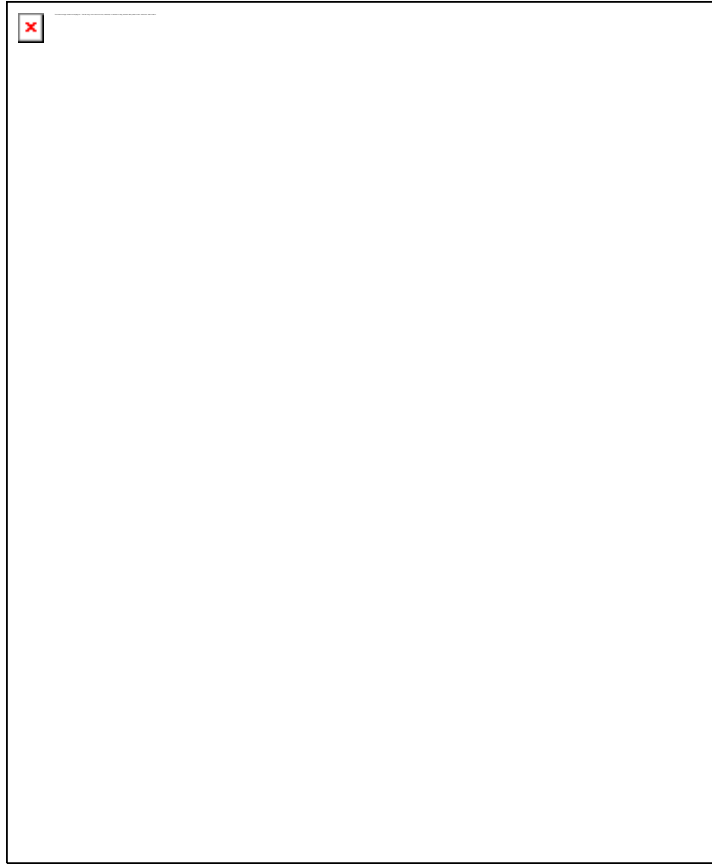
Tree label:	F	G	H
Trunk diameter:	78 cm	75 cm	78 cm
Health:	Fair to good	Good	Very good

Apart from the Yellow Gums, the only other indigenous vegetation that was found in Grace Park was some Kidney-weed (*Dichondra repens*) growing beneath Tree H (next to Charles St).

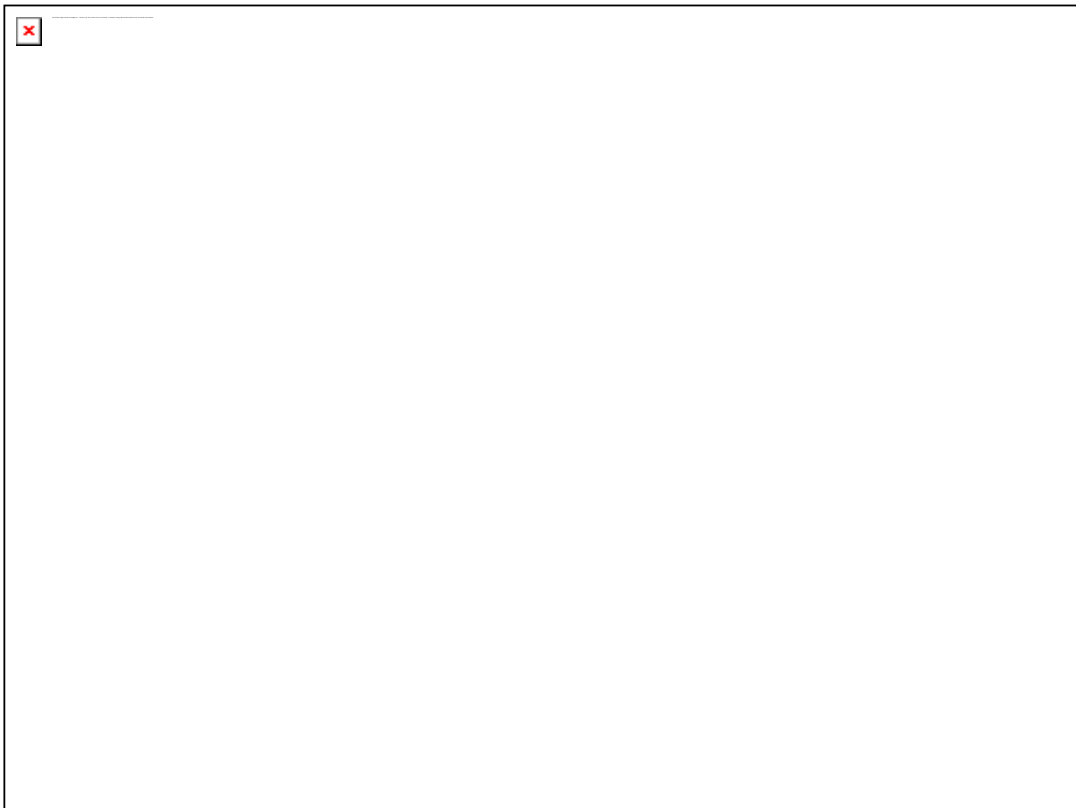
Ecological links with other land

This site is quite ecologically isolated from any substantial areas of habitat for native flora or fauna. The nearest areas of indigenous vegetation are:

- The Hilda Crescent site (Site 45) that is marked on the aerial photograph on page 376; and
- The stand of River Red Gums with rudimentary native understorey beside Lennox St, in Site 47 (page 382)



Site 46 Photo 1. Tree F viewed from Charles St, showing a healthy crown and trunk.



Site 46 Photo 2. Tree G (right) and Tree H (just left of the park bench).

There are also non-indigenous eucalypts in Grace Park and in the neighbourhood generally. These trees augment the food source that the remnant trees provide for native birds and insects.

Former habitat type

This site would once have been within of a stand of Creekline Grassy Woodland (EVC 68).

Flora of special significance

One significant plant species was found:

Conservation Status			Species Name
Victoria	Melbourne	Boroondara	
Vulnerable	Rare or threatened	Vulnerable	<i>Eucalyptus leucoxylon</i> subsp.

Vulnerable Rare or threatened Vulnerable *Eucalyptus leucoxylon* subsp.

The conservation status rating, 'vulnerable', is explained in Section 2.5.2 (page 18).

Site significance rating

If the three Yellow Gum trees (*Eucalyptus leucoxylon*) can be established to be natural occurrences (as suggested by trunk diameters of 78 cm), they represent a population of a subspecies that is endemic to Victoria and listed as vulnerable. This would represent **State** significance under BioSites criterion 3.1.2 (Amos 2004). The location of these trees on alluvial soil would be very unusual in the Melbourne area, adding to the trees' significance.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Eucalypt dieback disease due to possums.	Yellow Gum	Moderate	Potential
Eucalypt dieback disease due to psyllids, leaf skeletonisers, leaf miners, borers, galls, drought stress or other causes.	Yellow Gum	Moderate	Potential

Priority action

The cause of Tree G's debilitation was not determined with confidence in this study, but possums seem likely contributors. It would be wise to fit a possum collar to avoid possum damage.

Information sources used in this assessment

- A site inspection on 11th February 2005 using this study's standard approach described in Section 2.3.5, including a search for native vegetation, then mapping, measuring and photographing the trees and assessing their health;
- An inspection of the Department of Sustainability & Environment's fauna and BioSites databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Recommended further investigation

It is important to establish whether the three *Eucalyptus leucoxylon* trees are natural or not, if possible. The trees are of State significance if they are natural. An expert on eucalypts has been approached to assist, but he was unavailable during this study.

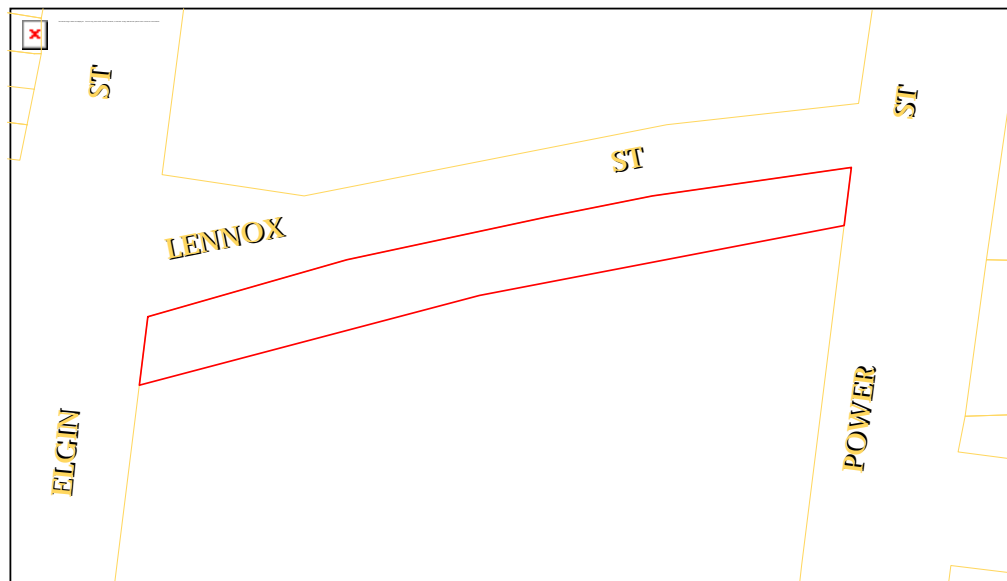
Site 47. Lennox St Rail Reserve, Hawthorn

A 100-metre-long section of a railway cutting's batter (or steep slope) and brow. Melway ref. 45 B10.

Site Biological Significance Level: *Below the BioSites Rating Threshold*

Summary of the most significant natural assets:

- Over thirty remnant River Red Gums, the largest approaching the status of a large old tree;
- A large number of plants of four native grass species;
- Two plants of the locally vulnerable Finger Rush, *Juncus subsecundus*, possibly part of a larger population extending along the railway line.



Scale 1:1,000
5 0 10 20 30 40 50 m

Boundaries

This site is outlined in red on the aerial photograph. The southern edge follows the gutter at the base of the railway cutting on the northern side of the tracks. The remaining edges are property boundaries.

Land use & tenure

The batter (or steep slope) and brow of a railway cutting, apparently the management responsibility of VicTrack.

Physical features

Site area: 865 m² (in horizontal projection)

Elevation: 14 m to 18 m

Landform: Lower valley slope, surrounded by hills of very shallow relief.

Slope: There is a narrow strip along the northern edge (above the cutting) with very little slope. The batter itself is very steep.

Soil type: Light grey loam over a yellow-brown mottled clay subsoil.

Underlying geology: Sandstones of the Dargile formation, which is Silurian.

Site description

The narrow, flat strip of land above the railway cutting supports the following indigenous vegetation:

- Six mature River Red Gums (*Eucalyptus camaldulensis*) with diameters up to 78 cm in trunk diameter;
- Approximately twenty-five much younger trees of the same species;

- Large numbers of the native grasses, Clustered Wallaby-grass (*Austrodanthonia racemosa*) and Long-hair Plume-grass (*Dichelachne crinita*); and
- Moderate numbers of Bristly Wallaby-grass (*Austrodanthonia setacea*) and Weeping Grass (*Microlaena stipoides*).

The eucalypts are very variable in health, from fair to good. The ratio of native to introduced ground flora varies between high and low, due to the history of excavations and dumping of soil and organic material.

The native grasses extend down the batter of the cutting, where weeds are more abundant.

Toward the top of the batter, on a small terrace in the east, are two plants of the locally vulnerable Finger Rush, *Juncus subsecundus*.

No other indigenous plant species were detected.

Ecological links with other land

This site is quite ecologically isolated from any substantial areas of habitat for native flora or fauna. The nearest areas of indigenous vegetation are:

- The Hilda Crescent site (Site 45, page 376), 100 m to the northeast;
- Several large old River Red Gums in St James Park (Site 48, page 385), 300 m to the west; and
- The Yarra River corridor (including Site 16, page 182), 600 m to the south.

Based on the Atlas of Victorian Wildlife's records of birds in the area, some nomadic native birds move along the Yarra River and digress into surrounding areas of Hawthorn. Some of these birds may occasionally visit and feed on the River Red Gums in the Lennox St site.

Habitat type

Plains Grassy Woodland (EVC 55, **endangered** in the Gippsland Plain bioregion).

The native vegetation of this site would once have been part of an area of Plains Grassy Woodland.

Flora of special significance

One significant plant species was found:

Conservation Status in Boroondara	Species Name	Notes
Vulnerable	<i>Juncus subsecundus</i>	Only two individuals were found, but they may be part of a much larger population extending along the railway line.

The conservation status rating, 'vulnerable', is explained in Section 2.5.2 (page 18).

Site significance rating

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Regionally threatened Ecological Vegetation Class

Plains Grassy Woodland in the Gippsland Plain bioregion is listed as endangered, but the representation in this site is so small and degraded that it does not meet BioSites criterion 3.2.3 for threatened EVCs.

Rare or threatened plants

The two plants of *Juncus subsecundus* cannot be deemed a viable population in the absence of any indication that there are other individuals further along the railway line (or elsewhere nearby). The BioSites criterion for locally threatened species therefore does not apply.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Spanish Heath (<i>Erica lusitanica</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Rice Millet (<i>Piptatherum miliaceum</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>); • Moderately serious: Fennel (<i>Foeniculum vulgare</i>). 	All	Moderate	Current
Eucalypt dieback, presently due to psyllid attack and potentially due to other insects or possums in future.	Trees	Moderate	Current

Priority action

This short section of railway reserve deserves more vegetation management effort than applies along the line generally. The main focus should be control of the weed species listed in the table above.

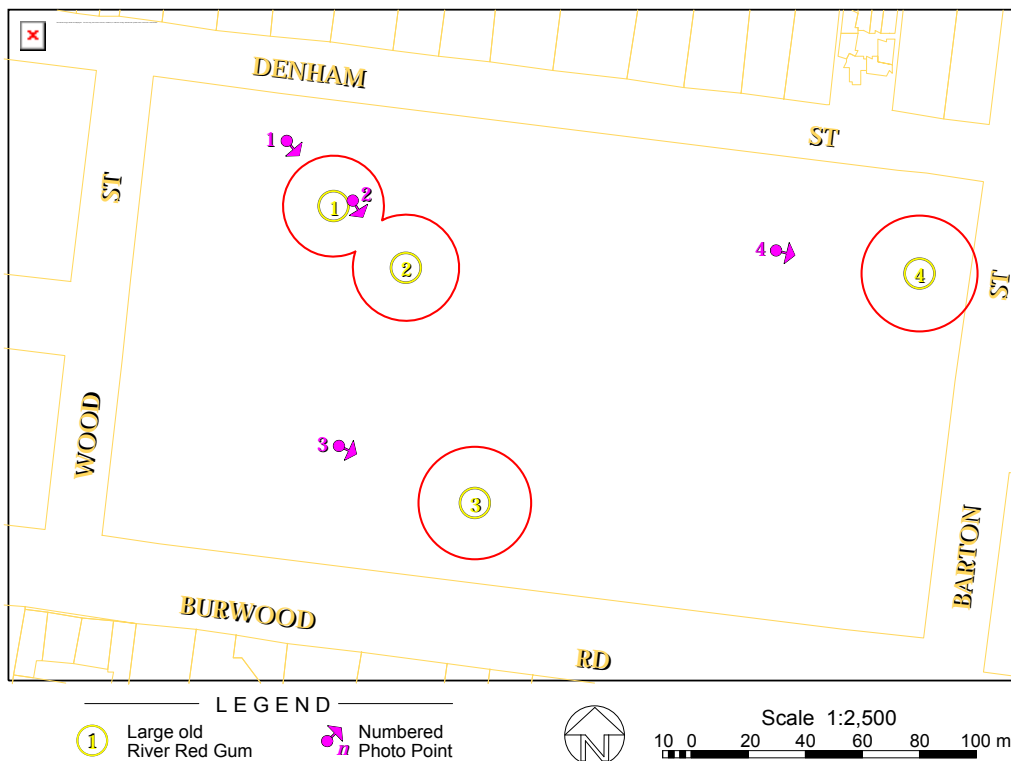
Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer on 11th February 2005 for twenty-five minutes, using this study's standard approach described in Section 2.3. This included:
 - Compilation of a list of indigenous plant species and environmental weeds, including measures of the abundance of indigenous species and the seriousness of environmental weeds;
 - Documentation of the population size of the locally threatened *Juncus subsecundus*;
 - Counting of River Red Gums, recording their health and measuring of the largest one; and
 - Checks for fauna habitat, ecological threats and management issues;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Site 48. St James Park, Hawthorn

Four large old River Red Gums that are major visual features of an amenity and recreation park. Melway ref. 44 K10

Site Biological Significance Level: *Below the BioSites Rating Threshold*



Boundaries

This site is formed by circles centred on four large old River Red Gums, as shown in red on the aerial photograph above. The radius of each red circle is eighteen times the diameter of the associated tree trunk (as tabulated below), corresponding to the Tree Protection Zone recommended by Matheny and Clark (1998) for over-mature trees belonging to species that are sensitive to root disturbance.

Land use & tenure

Council park for amenity, sport and a war memorial.

Physical features

Site area: 0.45 hectares

Elevation: 14 m to 28 m

Landform: The area west of the oval is on the mid-slope of a low hill. The easternmost tree is on the bank of a creek that has been filled in.

Slope: The trees west of the oval are on a southeast-facing slope of 1:13. The easternmost tree is on flat land.

Soil type: Mostly light grey loam over yellow-brown mottled clay subsoil, but at least some of the root system of Tree 4 is in alluvium.

Underlying geology: Sandstones of the Dargile formation, which is Silurian.

Site description

The only indigenous vegetation that was found in St James Park comprised:

- The four River Red Gums (*Eucalyptus camaldulensis*) that are marked and numbered on the aerial photograph and depicted in the photographs on the next page; and
- A patch of lawn dominated by the native grasses, Weeping Grass (*Microlaena stipoides*) and Clustered Wallaby-grass (*Austrodanthonia racemosa*), on the roadside embankment southwest of Tree 3.

The native grasses are of little biological significance and are therefore not included in the site delineated here.

The four River Red Gums all qualify as large old trees according to the criteria of the Department of Sustainability & Environment for woodlands dominated by Red Gums. The trees are probably centuries old, and appear to have been well cared for in recent years. Their basic characteristics are tabulated below.

Tree number:	1	2	3	4
Trunk diameter:	98 cm	103 cm	110 cm	113 cm
Height:	19 m	27 m	28 m	21 m
Health:	Fair	Good	Very good	Good

Note that Trees 2 and 3 are very tall for River Red Gums in the Melbourne area. The quoted heights were determined by a clinometer, with a precision of approximately ± 2 m.

Tree 1 has visible hollows that would suit occupation by native fauna. Tree 2 is notable for its unusual bark (see the photo).

Ecological links with other land

The nearest areas of indigenous vegetation are:

- The Yarra River corridor, including Yarra Bank Reserve (Site 15, page 178), 400 m to the west;
- 900 m² of degraded woodland in the Lennox St rail reserve (Site 47, page 382), 300 m to the east; and
- Thee Yellow Gums in Grace Park (Site 46, page 379), 500 m to the east.

Based on the Atlas of Victorian Wildlife's records of birds in the area, some nomadic native birds move along the Yarra River and digress into surrounding areas of Hawthorn. Some of these birds may occasionally visit and feed on the River Red Gums in St James Park.

Habitat type

Trees 1, 2 and 3 would once have been within a stand of Plains Grassy Woodland (EVC 55). Tree 4 is on a former creek bank and would have been within a stand of Creekline Grassy Woodland (EVC 68).

Site significance rating

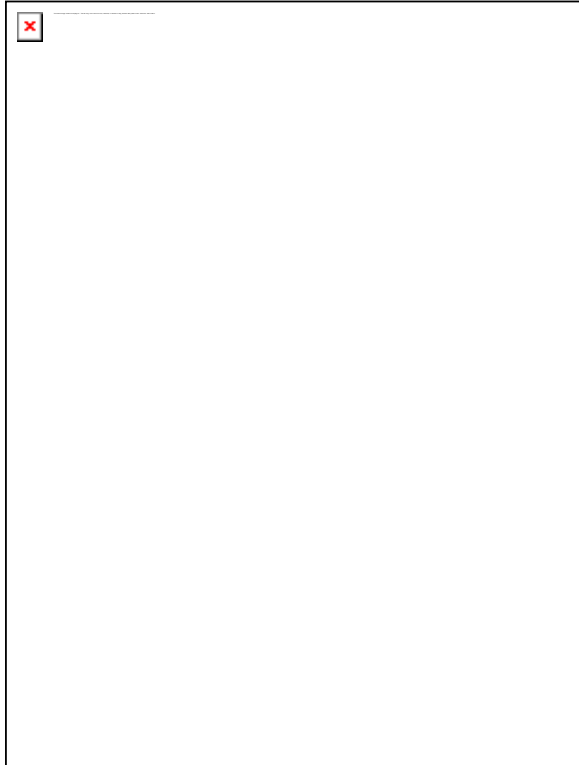
The BioSites criteria of the Department of Sustainability & Environment (Amos 2004) do not recognise any biological significance of individual River Red Gums, regardless of their size. The St James Park trees therefore have a rating of 'Not significant' by the BioSites criteria.

This should not be taken to imply that these River Red Gums have no value.

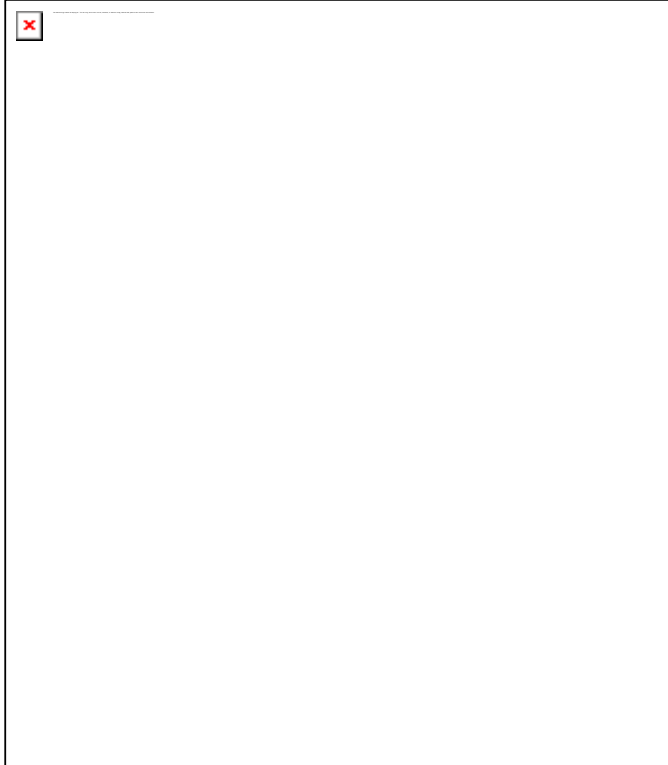
A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as the ones of interest here. However, the latest version states, '*Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats*'. The last sentence is not correct in the context of St James Park, or Boroondara more generally.

Information sources used in this assessment

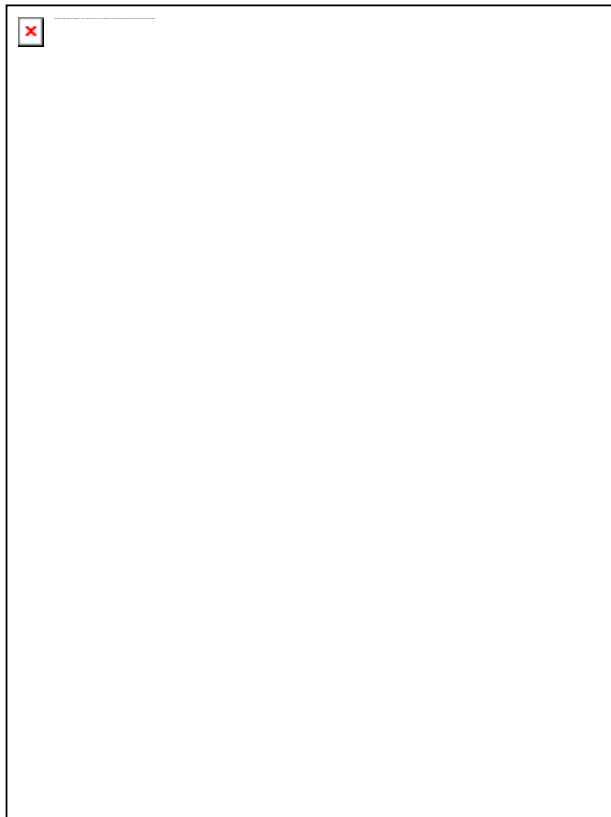
- A site inspection of one hour on 11th February 2005 using this study's standard approach for scattered trees described in Section 2.3.5, including a search for any native vegetation;
- Incidental records of fauna during the site inspection (including an observation of Brown Thornbill);
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.



Site 39, Tree 1. Note the sparse crown and recent lopping.



Site 39, Tree 2. The bark is unusually yellowish.



Site 39, Tree 3.



Site 39, Tree 4.

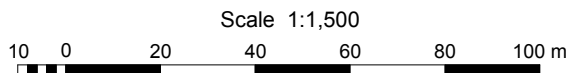
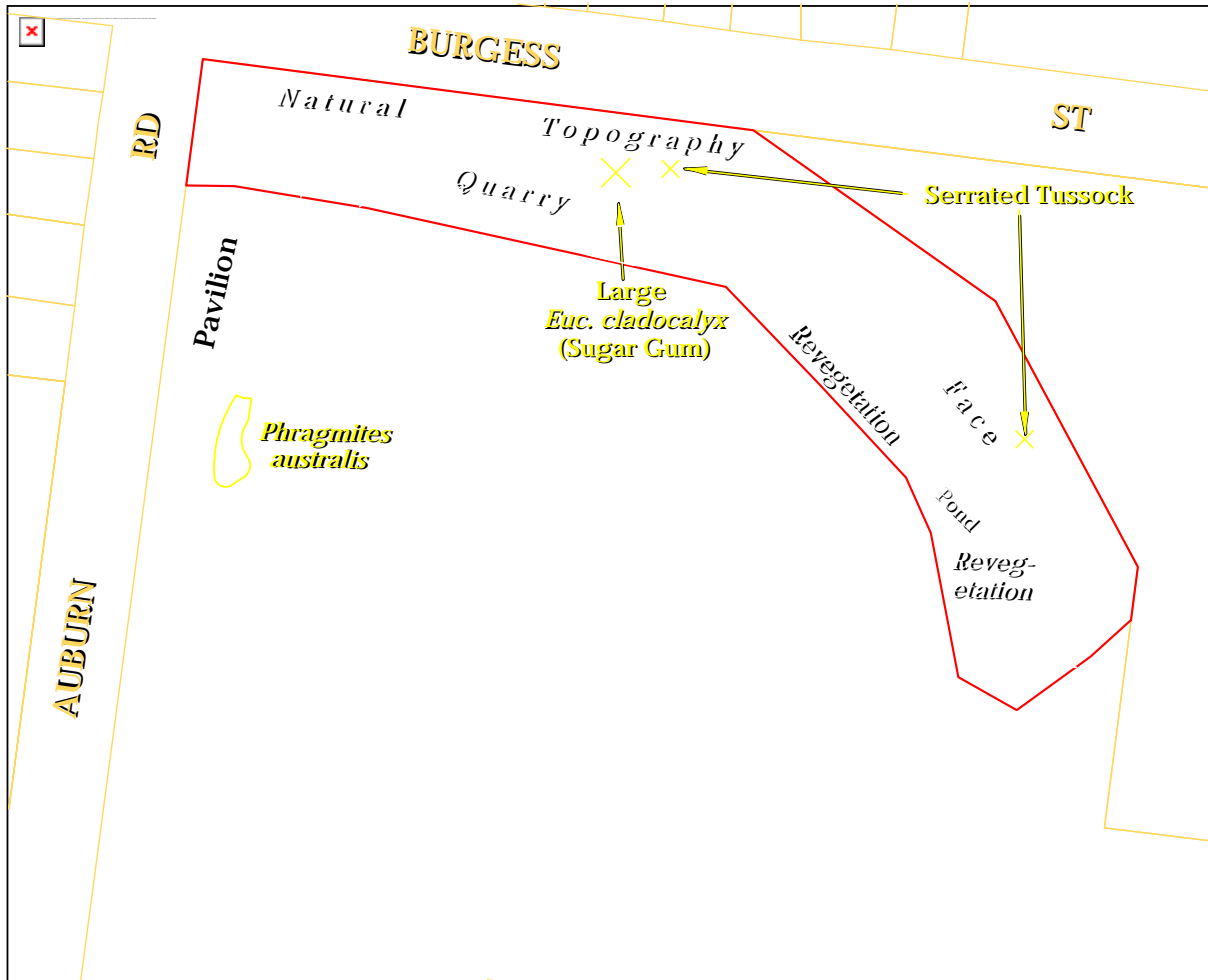
Site 49. John Gardiner Reserve, Hawthorn East

The face of a disused quarry, and a strip of land adjoining the upper edge. Melway ref. 59 F3.

Site Biological Significance Level: *Regional*

Summary of significant natural assets:

- Large numbers of the locally endangered Berry Saltbush, *Atriplex semibaccata*, and moderate numbers of the locally vulnerable Pale Rush, *Juncus pallidus*;
- The Ecological Vegetation Class present is the endangered Plains Grassy Woodland, albeit heavily modified in botanical composition and topography.



Boundaries

The site is outlined in red on the aerial photograph above. The site boundary follows property boundaries or fences, except in the southeast corner and beside the sports pavilion.

Land use & tenure: Education land, managed by a Committee of Management with representatives of Hawthorn Secondary College and the City of Boroondara. The site is mostly fenced to prevent access to the steep and dangerous quarry face, but there are publicly accessible sections beside Burgess St and near the sports pavilion.

Physical features

Site area: 0.77 hectare

Elevation: 11 m to 30 m

Landform: The natural landform is the lower slope of a gently sloping hill with low relief.

Slope: The natural topography has a gradient of typically 1:15 with a west to southwesterly aspect. The quarry face has variable slope, up to nearly vertical.

Soil type: Light grey loam over yellow-brown mottled clay subsoil.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek formation, which is dominated by siltstone.

Site description

This site was once part of the Auburn Quarry, long since disused. Practically all vegetation was cleared for the quarry, but many native grasses and saltbushes have regenerated naturally between Burgess St and the bottom of the steep quarry face. A large Sugar Gum (*Eucalyptus cladocalyx*) from South Australia is visually prominent at the top of the quarry face, creating soil conditions beneath its crown that favour remnant indigenous ground flora rather than weeds. The locally endangered Berry Saltbush, *Atriplex semibaccata*, is abundant beneath the Sugar Gum's crown.

By comparison, the quarry face has a substantially higher cover of weeds - particularly woody weeds such as Boneseed and African Box-thorn. Nevertheless, the quarry face is very variable in rockiness, slope and aspect, and some patches of the face are dominated by indigenous grasses.

Well-maintained gardens of indigenous and Australian native species have been planted near the sports pavilion and along the western part of the Burgess St roadside. Indigenous species have also been used to revegetate at the foot of the quarry face, with varying success. One of the factors that appears to be contributing to death of some revegetation plants in the southeast is contamination of water at the foot of the quarry face. The pond in that location smells foul and is overrun with weeds that tend to indicate eutrophication (i.e. ecological degeneration due to saturation levels of nutrients).

John Gardiner Reserve also has a patch of the locally vulnerable Common Reed (*Phragmites australis*) near Auburn Rd, as marked on the aerial photograph. However, it is isolated from any other indigenous vegetation and therefore not included in the site delineated here.

Ecological links with other land

This site is 200 m northeast of Gardiners Creek, which functions as a wildlife corridor for birds such as Sacred Kingfisher, Grey Fantail and Brown Goshawk (as discussed in the sections of this report about sites on this corridor, such as Nettleton Park Reserve on page 208). It is possible that some of these birds digress from the creek to visit trees around Burgess St, including the large Sugar Gum in John Gardiner Reserve. However, the extent of ecological linkage between John Gardiner Reserve and other sites is likely to be minor.

Habitat types

Plains Grassy Woodland (EVC 55, **endangered** in the Gippsland Plain bioregion).

Canopy trees: No indigenous canopy trees remain, but there is a single, large *Eucalyptus cladocalyx* that is acting as an ecological surrogate for the *Eucalyptus camaldulensis* that would once have occurred on the site.

Lower trees: *Acacia mearnsii* grows in the revegetation area in the southeastern corner of the site, and its size suggests that it has probably not been planted. There is also an *Acacia melanoxydon* near Burgess St that appears likely to be natural.

Shrubs: Scattered *Bursaria spinosa*, two *Acacia paradoxa* and one *Solanum laciniatum*, of which only the *Bursarias* can be confidently presumed to be natural rather than the progeny of planted parents.

Vines and ferns: None.

Ground flora: The indigenous ground flora is dominated by *Austrodanthonia setacea*, represented by two distinct forms. *Einadia nutans*, *Atriplex semibaccata*, *Oxalis perennans/exilis* and *Senecio quadridentatus* are abundant, but with lower coverage than *Austrodanthonia setacea*. The characteristic species, *Dichelachne crinita*, is present in moderate numbers.

Habitat Score

A habitat score was determined using the habitat hectare method (Section 2.3.4, page 13) for the western half of the site, excluding the planted area next to the sports pavilion. This area measures approximately 0.25 ha.

The habitat score measured on 10/12/04 was 18%, ignoring the large Sugar Gum, *Eucalyptus cladocalyx*. However, taking into account the Sugar Gum's effects on soil nutrients, soil moisture and shade, and its provision of organic litter, food and nest sites, it is functioning ecologically very much like the River Red Gums that would have occurred there prior to settlement. It therefore seems unreasonable to ignore the Sugar Gum's ecological values when determining a habitat score.

If the Sugar Gum is treated the same as a natural canopy tree, the habitat score increases from 18% to 27%. Either of these figures is enough to qualify the vegetation as 'High' conservation significance under *Victoria's Native Vegetation Framework* (NRE 2002a), taking into account that the vegetation belongs to an endangered EVC.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Notes
Endangered	<i>Atriplex semibaccata</i>	Abundant beneath the large Sugar Gum.
Endangered	<i>Solanum laciniatum</i>	One occurring naturally on quarry face; others planted.
Vulnerable	<i>Carex breviculmis</i>	Only one individual was found.
Vulnerable	<i>Juncus pallidus</i>	Scattered near the base of the western quarry face.
Vulnerable	<i>Phragmites australis</i>	Dominant within the patch marked on the aerial photograph, outside the site delineated here.
Vulnerable	<i>Schoenus apogon</i>	Very few.

Full flora list

The table below lists the wild plant species recorded by the author in John Gardiner Reserve. The entries for *Acacia melanoxylon* and *Acacia paradoxa* are preceded by obelisks (†) to indicate that there is some doubt about whether those species are natural or the progeny of planted specimens. The numbered columns correspond to the following areas:

- 1 = Between Burgess St and the quarry face;
- 2 = On the quarry face;
- 3 = Within the revegetation areas at the foot of the quarry face.

In the grid squares for the indigenous species:

- D = the species is dominant in its vegetation stratum;
- M = many plants;
- ✓ = moderate numbers; and
- = very few plants.

For weed species, the codes 's', 'm' and 'n' indicate weeds of serious, moderate or insignificant impact (respectively).

Species Name	Area			Species Name	Area			Species Name	Area		
	1	2	3		1	2	3		1	2	3
Wild indigenous species				Weed species							
† <i>Acacia melanoxylon</i>	-			<i>Acacia baileyana</i>		n		<i>Galium aparine</i>		m	m
<i>Acacia mearnsii</i>			✓	<i>Aira caryophylla</i>		n		<i>Hypochoeris radicata</i>			m
† <i>Acacia paradoxa</i>	-			<i>Anagallis arvensis</i>			n	<i>Lactuca serriola</i>			n
<i>Atriplex semibaccata</i>	M			<i>Avena barbata</i>	m	m	m	<i>Lepidium africanum</i>	m		
<i>Austrodanthonia fulva</i>	✓			<i>Brassica ?fruticulosa</i>	s	m	m	<i>Lolium perenne</i>	m		
<i>Austrodanthonia racemosa</i>	✓	✓	✓	<i>Briza maxima</i>			m	<i>Lycium ferocissimum</i>	s	s	
<i>Austrodanthonia setacea</i>	D	D		<i>Briza minor</i>	n	n	n	<i>Malva sp.</i>			m
<i>Bursaria spinosa</i>	✓	✓		<i>Bromus catharticus</i>			m	<i>Nassella trichotoma</i>	s		
<i>Carex breviculmis</i>		-		<i>Bromus diandrus</i>	m			<i>Pinus pinaster</i>		n	
<i>Dichelachne crinita</i>		✓		<i>Bromus ?madridentis</i>			m	<i>Piptatherum miliaceum</i>	m	m	
<i>Einadia nutans</i>	M	✓		<i>Centaurium tenuiflorum</i>		n		<i>Pittosporum undulatum</i>		s	
<i>Epilobium hirtigerum</i>		✓	-	<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	s	s	m	<i>Plantago lanceolata</i>	m		
<i>Juncus pallidus</i>		✓		<i>Cirsium vulgare</i>			n	<i>Prunus cerasifera</i>	m		
<i>Lachnagrostis filiformis</i>		-		<i>Cotoneaster glaucophyllus</i>	m	m		<i>Romulea rosea</i>	m		
<i>Oxalis exilis/perennans</i>	M			<i>Cotoneaster pannosus</i>	m	m		<i>Rubus ?anglocandicans</i>		s	
<i>Schoenus apogon</i>		-		<i>Cynosurus echinatus</i>	n			<i>Solanum mauritianum</i>		m	
<i>Senecio quadridentatus</i>	M	✓		<i>Cyperus eragrostis</i>			m	<i>Solanum nigrum</i>			n
<i>Solanum laciniatum</i>	-			<i>Dactylis glomerata</i>	m	s	m	<i>Sonchus oleraceus</i>			n
				<i>Delairea odorata</i>			m	<i>Tribolium acutiflorum</i> s.l.		m	
				<i>Ehrharta erecta</i>	m		s	<i>Trifolium angustifolium</i>	m	m	
				<i>Ehrharta longiflora</i>	m		m	<i>Ulex europaeus</i>			s
				<i>Euphorbia peplus</i>			m	<i>Veronica persica</i>			n
				<i>Foeniculum vulgare</i>	m	s		<i>Vulpia bromoides</i>			m

Large old tree

The site's only mature eucalypt is a Sugar Gum (*Eucalyptus cladocalyx*), marked on the aerial photograph on page 388. This species is native to South Australia but the particular tree at John Gardiner Reserve is acting as an ecological surrogate for the River Red Gums that would have occurred there prior to European settlement. The tree is in good health. Its trunk diameter is 1.1 metres, which exceeds the Department of Sustainability & Environment's threshold of 0.8 metres for a large old tree in Plains Grassy Woodland. It was observed to be heavily visited by native birds, but only common species.

Full fauna list

The following list contains all fauna species recorded by the author in November-December 2004. Asterisks indicate introduced species.

Butterflies	Birds		
*Cabbage White	Masked Lapwing	Magpie-lark	*Common Blackbird
Caper White	*Spotted Turtle-Dove	Australian Magpie	*Common Starling
Yellow-banded Dart	Rainbow Lorikeet	Little Raven	*Common Myna
Reptiles	Brush Wattlebird	Welcome Swallow	
Garden Skink	White-plumed Honeyeater		

Site significance ratings

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Regionally threatened Ecological Vegetation Class

As discussed under the heading 'Habitat score', the native vegetation in the western half of the site is of 'High' conservation significance under 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), due to its habitat score and the endangered status of the EVC (Plains Grassy Woodland). This would translate to State significance under BioSites criterion 3.2.3, if the cover of native understorey vegetation were to exceed 10% over an area of at least 0.25 hectare.

However, the area that has at least 10% cover of native understorey is scarcely 0.25 hectare, and could be deemed either more or less than this threshold, depending on the assessment method used and probably also the time of year. In such a marginal case, the approach adopted here is to assign the intermediate **Regional** rating.

Rare or threatened plants

The populations of the locally endangered *Atriplex semibaccata* and the locally vulnerable *Juncus pallidus* are both apparently viable. Each one of these populations gives the site **Local** significance under BioSites criterion 3.1.5.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Dumping of garden waste and lawn clippings by neighbours, causing spread of weeds and death of indigenous plants beneath the waste.	All	Moderate	Current
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Twiggy Turnip (<i>Brassica ?fruticulosa</i>), Boneseed (<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>), Cocksfoot (<i>Dactylis glomerata</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Fennel (<i>Foeniculum vulgare</i>), African Box-thorn (<i>Lycium ferocissimum</i>), Serrated Tussock (<i>Nassella trichotoma</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Blackberry (<i>Rubus ?anglocandicans</i>), Gorse (<i>Ulex europaeus</i>); • Moderately serious: Bearded Oat (<i>Avena barbata</i>), Large Quaking-grass (<i>Briza maxima</i>), Prairie Grass (<i>Bromus catharticus</i>), Great Brome (<i>Bromus diandrus</i>), Compact Brome (<i>Bromus ?madritensis</i>), Cotoneaster (<i>Cotoneaster glaucophyllus</i>), Cotoneaster (<i>Cotoneaster pannosus</i>), Drain 	All	Moderate	Current

Threat	Natural assets affected	Severity	When?
Flat-sedge (<i>Cyperus eragrostis</i>), Cape Ivy (<i>Delairea odorata</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Petty Spurge (<i>Euphorbia peplus</i>), Cleavers (<i>Galium aparine</i>), Cat's Ear (<i>Hypochoeris radicata</i>), Common Pepper-cress (<i>Lepidium africanum</i>), Perennial Rye-grass (<i>Lolium perenne</i>), Mallow (<i>Malva</i> sp.), Maritime Pine (<i>Pinus pinaster</i>), Rice Millet (<i>Piptatherum miliaceum</i>), Ribwort (<i>Plantago lanceolata</i>), Cherry-plum (<i>Prunus cerasifera</i>), Common Onion-grass (<i>Romulea rosea</i>), Tobacco-bush (<i>Solanum mauritianum</i>), Plagiochloa (<i>Tribolium acutiflorum</i> s.l.), Narrow-leaf Clover (<i>Trifolium angustifolium</i>), Squirrel-tail Fescue (<i>Vulpia bromoides</i>).			
Water pollution: The pond marked on the aerial photograph smells foul and indigenous plants are being completely out-competed by weeds.	Frogs, wetland flora	Low	Current
Insect attack of Black Wattles (<i>Acacia mearnsii</i>).	Plains Grassy Woodland	Low	Current

Priority actions

1. Inform local residents about the site's significance and the damage that is done by dumping garden waste and lawn clippings into the site. The importance and urgency of this action are high, from the perspective of the whole municipality.
2. Eradicate the two outbreaks of Serrated Tussock (*Nassella trichotoma*) at the approximate locations shown on the aerial photograph on page 388. The importance and urgency of this action are high, from the perspective of the whole municipality.
3. Schedule regular weed removal work on and above the quarry face. This will have to be done with special attention to the occupational health and safety risks associated with the quarry face. The importance of this action is high and the urgency is moderate, from the perspective of the whole municipality.
4. Arrange a chemical analysis of the foul-smelling water in the pond that is marked on the aerial photograph, with a view toward determining the risk of toxicity and the possibility of remediation. The importance and urgency of this action are low to moderate, from the perspective of the whole municipality.

Past management and revegetation

See the section headed 'site description' on page 389. Management has been guided by the 1998 document, 'Management Plan for Auburn Quarry, Hawthorn, City of Boroondara' by E. Donoghue.

Future revegetation

There is no need for additional revegetation until the woody weeds are controlled on the quarry face and the contamination of water in the pond is assessed and perhaps remediated. Following the control of the woody weeds, indigenous shrubs belonging to species found on escarpments could be planted just above the quarry face. *Bursaria spinosa*, *Dodonaea viscosa* and *Myoporum* sp. 1 would be well suited for this purpose. The 1998 management plan for the site by Elizabeth Donoghue provides additional guidance, although some of the species suggested by her are not well suited (e.g. *Correa reflexa* and *Platylobium formosum*). (Note that Donoghue refers to the site as the Auburn Quarry.)

Monitoring

No pre-existing data appears to be available to allow monitoring trends in the ecological values of this site.

The following items have been gathered to provide a baseline for future monitoring:

- The flora lists for the various parts of the site, as provided beneath the heading 'Full flora list' above. Repeat at intervals of no more than four years. Check for loss or decline of indigenous species and shifts in the threat ratings of weeds;
- Population sizes of scarce plant species, as indicated in the sections headed 'Habitat type' and 'Flora of special significance'. Check the populations at the same time as updating the flora lists;
- The habitat score calculation. The original paper field data sheets are kept with this project's file. The score should be redetermined every time (or every second time) that the above monitoring tasks are undertaken.

Information sources used in this assessment

- A brief inspection of the site by the author with staff of the City of Boroondara on 6/9/04;
- A vegetation and habitat survey by Dr Lorimer for a total of four hours and five minutes on 29/11/04 and 10/12/04, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species in each of four parts of the site, including the indigenous species' abundances and the threat level of all weed species in each area;
 - Determination of the habitat score of the site's western half;
 - Assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Measurement of the large old Sugar Gum;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- *'Management Plan for Auburn Quarry, Hawthorn, City of Boroondara'* by E. Donoghue (1998), commissioned by the City of Boroondara. 23 pp. + 2 maps.
- Inspection of the Department of Sustainability & Environment's flora and fauna databases (which yielded no records);
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

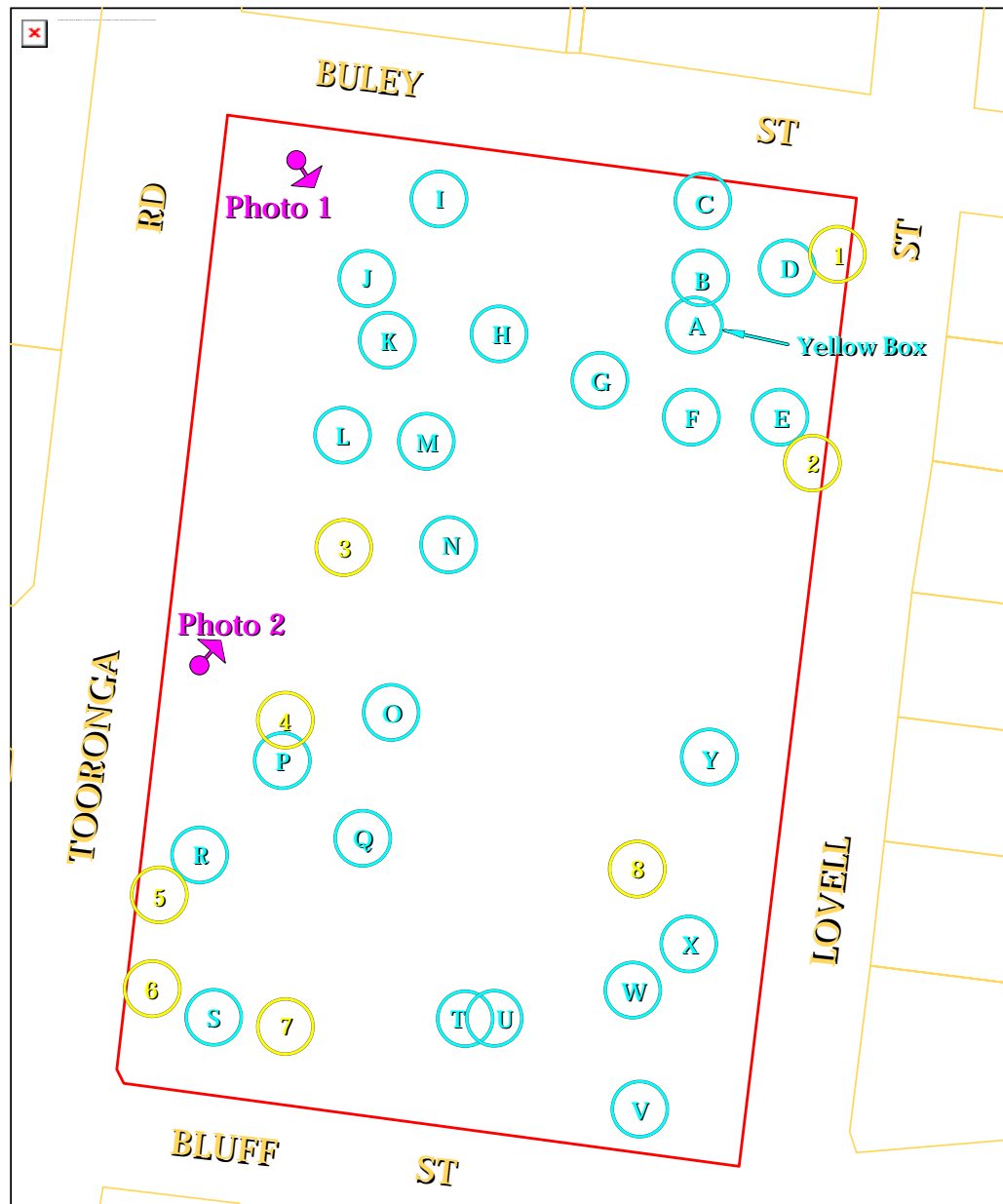
Site 50. Cato Park, Hawthorn East

Council amenity park with many trees, both natural and planted. Melway ref. 59 F4.

Site Biological Significance Level: *Below the BioSites Rating Threshold*

Summary of the most significant natural assets:

- Eight large old River Red Gums;
- Twenty-four smaller River Red Gums and one Yellow Box (the latter being a locally vulnerable species).



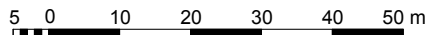
LEGEND

- ① Numbered trees with trunk diam. >0.8 m
- Ⓐ Letter-labelled trees with trunk diam. <0.8 m

Labelled trees are River Red Gums, except the one labelled 'Yellow Box'.



Scale 1:1,000



Boundaries

This site is the whole of Cato Park, as outlined in red above.

Land use & tenure

Council amenity park with a playground.

Physical features

Site area: 1.3 hectares

Elevation: 22 m to 30 m

Landform: Mid-slope of a ridge with low relief and shallow gradients.

Slope: Typical gradient 1:12, with a westerly aspect.

Soil type: Light grey loam over yellow-brown mottled clay subsoil.

Underlying geology: The bedrock is Silurian sedimentary rock (mainly siltstone) of the Andersons Creek formation.

Tree descriptions

As seen in the photographs on the next page, Cato Park is dominated by large specimens of naturally-occurring River Red Gums (*Eucalyptus camaldulensis*), some of them pre-dating European settlement. The other naturally occurring indigenous plants are one Yellow Box (*Eucalyptus melliodora*) and substantial numbers of Clustered Wallaby-grass (*Austrodanthonia racemosa*), Weeping Grass (*Microlaena stipoides*) and Common Cotula (*Cotula australis*). These native grasses and cotula cover less than 5% of the ground, and are fairly common in suburban lawns. The remaining ground flora comprises typical exotic species of lawns, which do not represent a significant threat to the continuing survival of the indigenous plants.

Along with the naturally occurring flora, there are a few planted trees of the indigenous Silver Wattle (*Acacia dealbata*) and Black Wattle (*Acacia mearnsii*), and many planted trees of species from other parts of Australia. There are also recent plantings of indigenous understorey species, including Clustered Everlasting (*Chrysocephalum semipapposum*), Hop Goodenia (*Goodenia ovata*), Wedge-leaf Hop-bush (*Dodonaea viscosa*), Spiny-headed Mat-rush (*Lomandra longifolia*) and Common Tussock-grass (*Poa labillardierei*).

The park's remnant eucalypts are its most important natural assets, and they have suffered in recent years from drought, insect attack and possum browsing. Possum damage has been particularly severe on some trees, even though adjacent trees that appear similar have not suffered. Plastic collars have been placed around many of the River Red Gums as barriers to possums, but this has not helped some trees. Possums can move between the crowns of many of the trees, so that a single tree without a collar sometimes allows possums to access several neighbouring trees.

Photographs 1 and 2 on the next page provide representative views of the park's River Red Gums, taken on 21st January 2005. The locations and orientations of the camera are marked on the aerial photograph on page 394. The main purpose of the photographs is to provide a basis for detecting change in the extent of dieback in the tree crowns.

Eight of the River Red Gums qualify as large old trees according to the Department of Sustainability & Environment's criterion for woodlands dominated by Red Gums (i.e. trunk diameters of at least 0.8 m). These trees are each marked on the aerial photograph with yellow circles and numbers. They are up to approximately 18 m tall and over a century old. Their other characteristics are tabulated below:

Tree number:	1	2	3	4	5	6	7	8
Trunk diameter:	84 cm	81 cm	84 cm	110 cm	107 cm	111 cm	87 cm	80 cm
Health:	Good	Good	V. good	Good	V. good	Good	V. good	V. good

It is pleasing to see that the large old trees have survived the recent severe and protracted drought as well as the health ratings indicate.

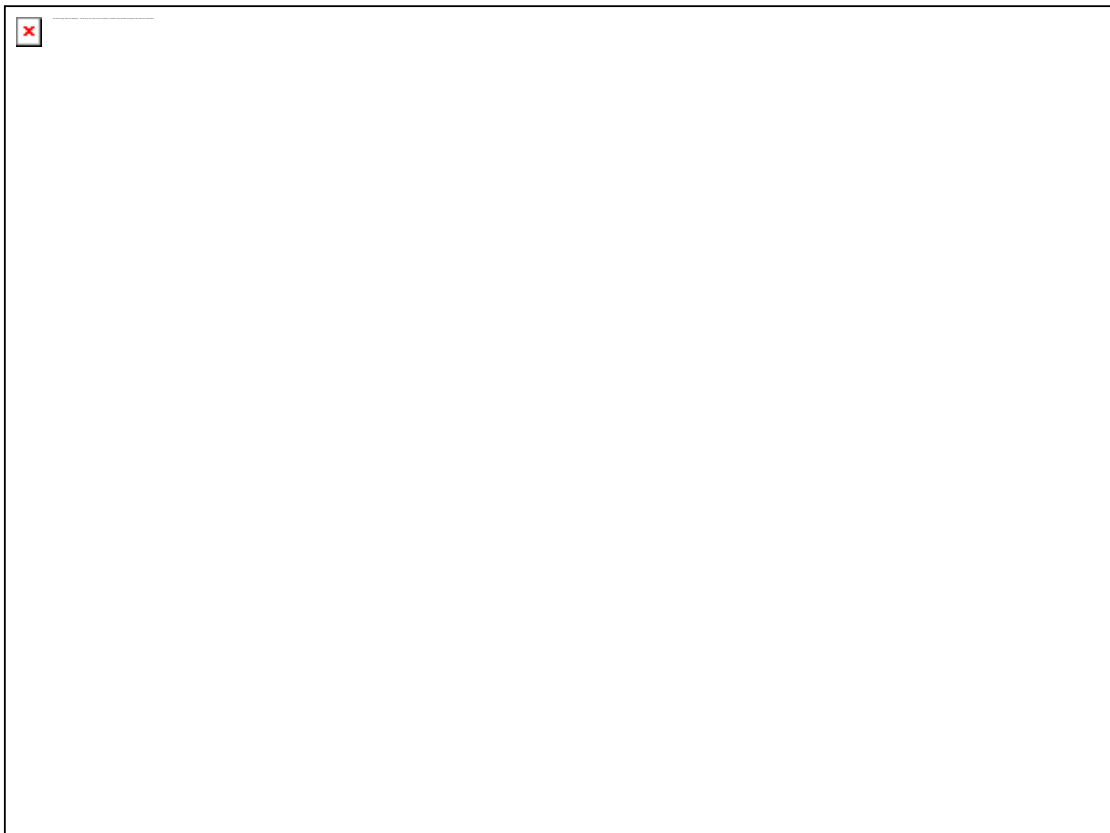
In addition to the large old trees, there are twenty-four other River Red Gums, labelled 'B' to 'Y' on the aerial photograph, and a single Yellow Box labelled 'A'. The characteristics of these trees are tabulated below:

Tree label:	A	B	C	D	E	F	G	H	I	J	K	L	M
Trunk diam.:	56 cm	43 cm	67 cm	39 cm	59 cm	? cm	60 cm	77 cm	71 cm	54 cm	57 cm	68 cm	52 cm
Health:	Good	Good	Good	Fair	Poor	Fair	Good	Good	Good	Good	V.good	Good	V.good

Tree label:	N	O	P	Q	R	S	T	U	V	W	X	Y
Trunk diam.:	51 cm	26 cm	45 cm	55 cm	40 cm	22 cm	10 cm	36 cm	59 cm	28 cm	59 cm	60 cm
Health:	Good	Good	Good	Poor	Good	Good	Good	V.good	Good	Good	V.good	Good



Site 50, Photo 1. A view from just northeast of the steps in the park's northwest, to monitor the extent of dieback.



Site 50, Photo 2. A northerly view from the central-western rubbish bin, again to monitor the extent of dieback.

Trees O, S and T are quite likely to have been planted. The probability that a tree is planted decreases with increasing trunk diameter.

Ecological links with other land

Cato Park is 400 m northeast of Gardiners Creek, which functions as a wildlife corridor for birds such as Sacred Kingfisher, Grey Fantail and Brown Goshawk (as discussed in the sections of this report about sites on this corridor, such as Nettleton Park Reserve on page 208). It is possible that some of these birds digress from the creek to visit trees in Cato Park, but such visits would be of minor ecological importance (with the possible exception of the Spotted Pardalote, which is an important controller of eucalypt-eating insect pests and might therefore be important to the health of Cato Park's trees).

John Gardiner Reserve (Site 49) lies 400 m northwest of Cato Park, but any ecological linkage between the two sites would be of minor ecological importance.

Former habitat type

Cato Park would once have been part of a stand of Plains Grassy Woodland (EVC 55).

Flora of special significance

One significant plant species was found:

Conservation Status in Boroondara	Species Name	Notes
Vulnerable	<i>Eucalyptus melliodora</i>	One individual, labelled 'A' on the aerial photograph on page 394.

The conservation status rating, 'vulnerable', is explained in Section 2.5.2 (page 18).

Full flora list

See the subsection headed 'Tree descriptions' two pages up.

Fauna of special significance

According to the Atlas of Victorian Wildlife, one significant fauna species has been observed in or near Cato Park:

Conservation Status			Species Name	Last Record
Victoria	Melbourne	Boroondara		
Critically Endangered	Endangered	Occasional Visitor	Regent Honeyeater	1984

The conservation status ratings are explained in Section 2.5.2 (page 18).

Sightings of Regent Honeyeaters are reported throughout Melbourne from time to time and a one-off sighting is of fairly minor significance.

Full fauna list

Birds are the only fauna group that have been recorded for Cato Park. The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species.

Galah	2005	Regent Honeyeater	1984	Little Raven	2005	*Common Myna	1984
Red Wattlebird	2005	Noisy Miner	2005	*Common Blackbird	2005		
Brush Wattlebird	2005	Magpie-lark	2005	*Common Starling	1984		

Site significance rating

The BioSites criteria do not recognise any biological significance of River Red Gums with very little native understorey, regardless of the trees' size.

Cato Park is therefore not significant under the BioSites criteria, but this should not be taken to imply that its centuries-old trees are not significant when considered against criteria related to heritage or aesthetics.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Eucalypt dieback disease due to possums.	Trees	Moderate	Current
Eucalypt dieback disease due to causes other than possums, such as psyllids, leaf skeletonisers, leaf miners or drought stress.	Trees	Low to moderate	Current

Recommendation

- During periods of drought, the remnant eucalypts should be inspected each summer to check whether irrigation is necessary to avoid deaths, and whether protection against possums needs to be improved.

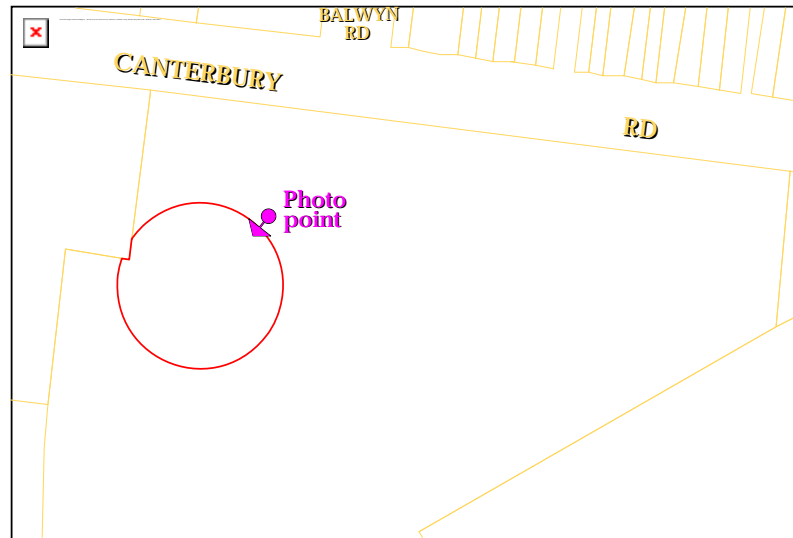
Information sources used in this assessment

- A site inspection on 14th January 2005 using this study's standard approach described in Section 2.3.5, including a search for native vegetation, then mapping, measuring and photographing the trees and assessing their health;
- An inspection of the Department of Sustainability & Environment's flora and fauna databases, from which was obtained the 1984 record of Regent Honeyeater;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Site 51. Canterbury Gardens' River Red Gum, Canterbury

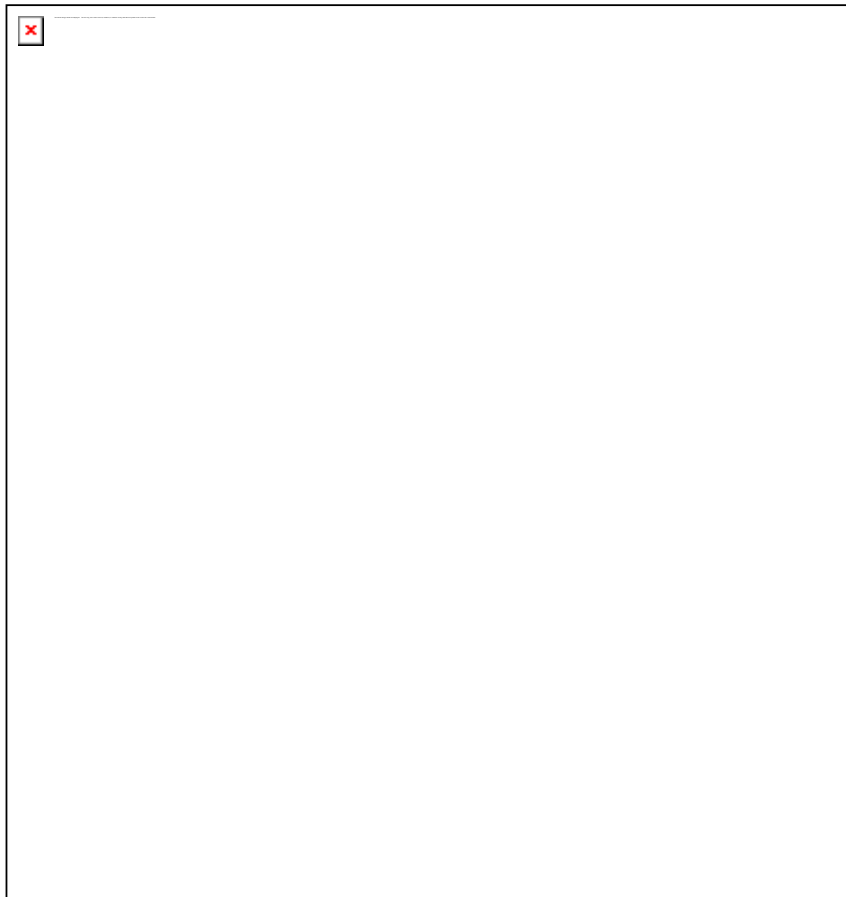
One very large River Red Gum in an amenity park, on Council's 'significant tree' list. Melway ref. 46 D11.

Site Biological Significance Level: *Below the BioSites Rating Threshold*



Scale 1:2,000

5 0 10 20 30 40 50 m



Boundaries

This site is outlined in red on the aerial photograph. Most of the boundary is a red circle of radius 23.5 metres centred on the trunk of the prominent River Red Gum (*Eucalyptus camaldulensis*) depicted in the photograph above. The radius of 23.5 metres is eighteen times the trunk diameter, corresponding to the Tree Protection Zone recommended by Matheny and Clark (1998) for over-mature trees belonging to species that are sensitive to root disturbance. The boundary's mostly circular shape is truncated slightly at the edge of the Canterbury Gardens property.

Land use & tenure: Council amenity park.

Physical features

Site area: 1,735 m²s

Elevation: 56 m

Landform: Beside a creek in undulating terrain.

Slope: 1:4 at the tree trunk.

Soil type: Alluvium.

Underlying geology: The bedrock beneath the alluvium is Silurian sedimentary rock of the Andersons Creek formation, which is dominated by siltstone.

Tree description

The tree in this site is listed as Tree 20 in the 'City of Boroondara Significant Tree Study' by John Patrick Pty Ltd (2001), because of its attractiveness, size, visual prominence and age. It has a trunk diameter of 1.30 m and a height of 27 m (measured by clinometer)*. Its trident-like structure is unusual and distinctive, adding to the tree's significance. However, that same structure is intrinsically less stable than the typical form of the species.

The tree is in good health and being well cared for.

The photograph of the tree on the previous page, taken on 11th February 2005, should assist future monitoring of the tree's health. Unfortunately, the photograph in the report by John Patrick Pty Ltd (2001) does not facilitate useful monitoring because the photograph does not extend as far as most of the outer branches (which is where any signs of dieback would have been evident).

The only other native vegetation found by the author in Canterbury Gardens was a population of some hundreds of plants of Clustered Wallaby-grass (*Austrodanthonia racemosa*) growing beneath the River Red Gum. This population is of only minor biological significance, as Clustered Wallaby-grass is fairly common in eastern suburban lawns.

Ecological links with other land

This site is quite ecologically isolated from other sites with native vegetation.

Habitat type

The River Red Gum would once have been located within a stand of Creekline Grassy Woodland (EVC 68).

Site significance rating

The BioSites criteria of the Department of Sustainability & Environment (Amos 2004) do not recognise any biological significance for isolated River Red Gums, regardless of their size or amenity value. This site therefore has a rating of 'Not significant' by the BioSites criteria.

This should not be taken to imply that this centuries-old tree is not significant when considered against criteria related to heritage or aesthetics.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as the one of interest here. However, the latest version states, 'Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats'. The last sentence is not correct in the context of Canterbury Gardens or Boroondara more generally.

* The report by John Patrick Pty Ltd quotes a girth equivalent to 1.21 m and a height of 19 m, but these appear to be inaccurate.

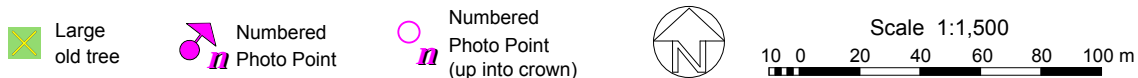
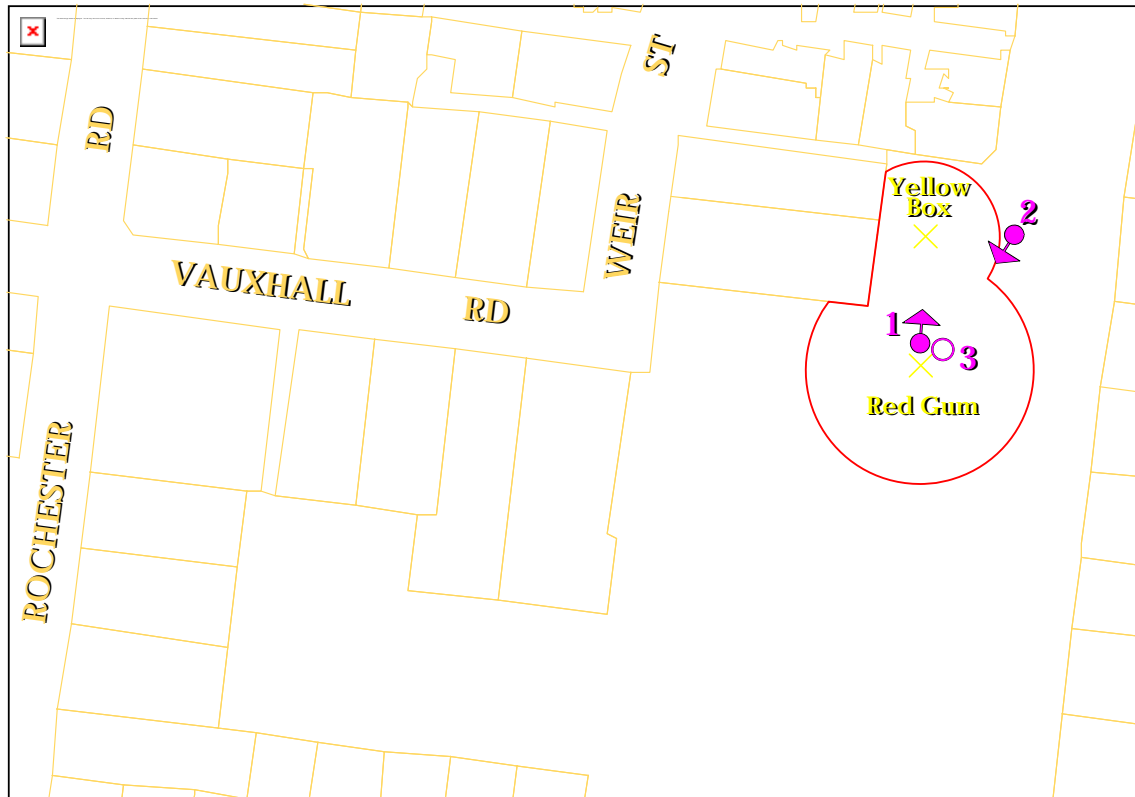
Information sources used in this assessment

- A site inspection on 11th February 2005 using this study's standard approach for scattered trees described in Section 2.3.5, including a search for native vegetation, then measuring and photographing the tree and assessing its health;
- The 289-page '*City of Boroondara Significant Tree Study*' by John Patrick Pty Ltd, dated May 2001;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Site 52. John August Reserve, Balwyn

Two large old eucalypts – a River Red Gum and a Yellow Box – in an amenity park. Melway ref. 46 E9.

Site Biological Significance Level: *Below the BioSites Rating Threshold*



Boundaries

This site is outlined in red on the aerial photograph, and contains all parts of the reserve that lie within either 24 metres of the centre of the trunk of the River Red Gum or 16 metres of the centre of the trunk of the Yellow Box. These radii are eighteen times the trunk diameters, corresponding to the Tree Protection Zone recommended by Matheny and Clark (1998) for over-mature trees belonging to species that are sensitive to root disturbance. The site boundary is truncated at the reserve's boundary because there is little risk to the trees from activities confined to the neighbouring properties.

Land use & tenure: Public park for recreation and drainage purposes.

Physical features of the land

Site area: 2,243 m²

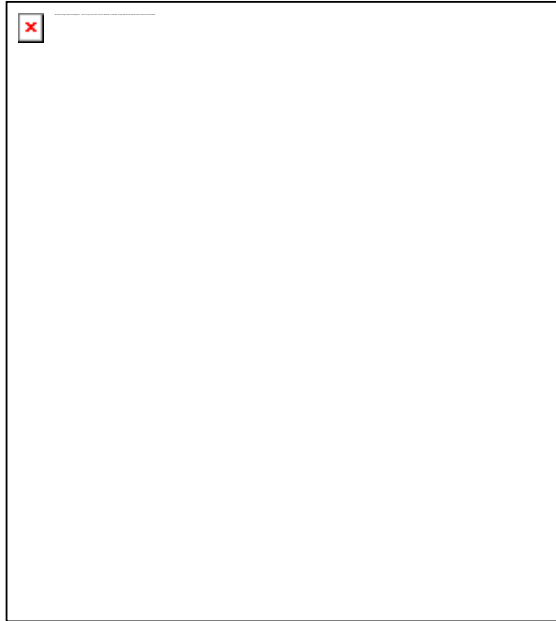
Elevation: 70 metres

Landform: The River Red Gum is on the valley floor of a creek flowing south (now converted into a barrel drain). The Yellow Box is on the western bank of the creek.

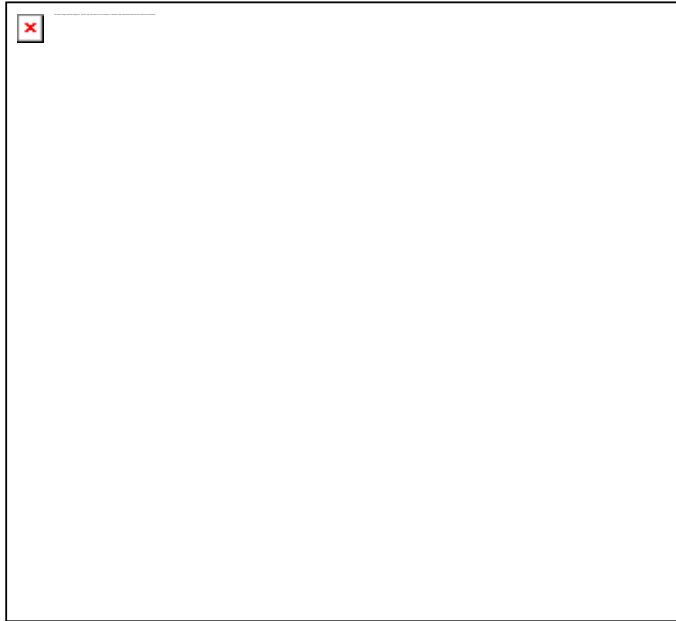
Slope: The River Red Gum is on almost flat ground and the Yellow Box is on a slope with a gradient of 1:7.

Soil type: The Yellow Box grows in thin, light grey loam topsoil with clay subsoil. The River Red Gum would have germinated in the alluvium of the creek and sent its roots down into the same subsoil as the Yellow Box, but it is not known what happened to the soil when the creek was converted to a barrel drain.

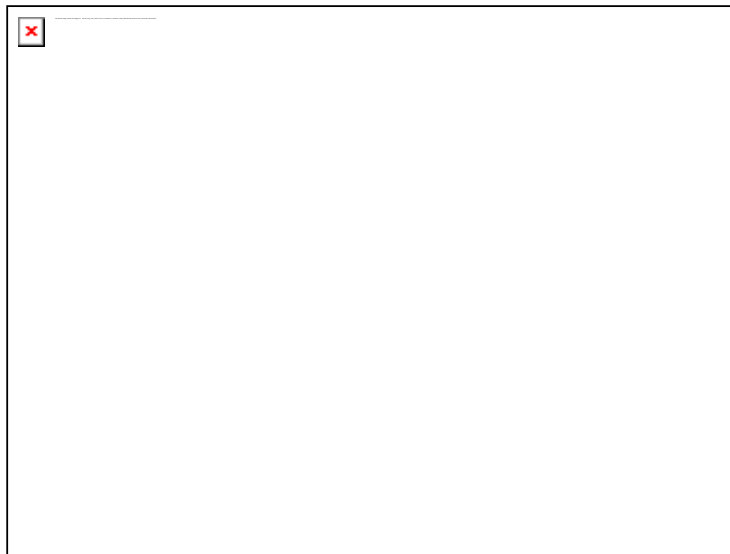
Underlying geology: The bedrock is part of the Silurian 'Andersons Creek' formation, which is dominated by siltstone.



Site 52 Photo 1. The Yellow Box tree, viewed from a drain grate located 5 m north of the River Red Gum. This is to show the foliage density of the crown and the condition of the trunk and limbs.



Site 52 Photo 2. The River Red Gum, viewed from approximately 35 m to the north-northeast, for the same purpose as Photo 1.



Site 52 Photo 3. Looking up through the crown of the River Red Gum from a pit drain cover approximately 7 m northeast of the trunk. This is to show the foliage density, the structure of the crown and the condition of the limbs.

Tree descriptions

The only native vegetation detected on this site comprised the two venerable eucalypts depicted above – a River Red Gum (*Eucalyptus camaldulensis*) and a Yellow Box (*Eucalyptus melliodora*). The trees would probably be centuries old, and both qualify as large old trees according to the Department of Sustainability & Environment's criteria. The River Red Gum is listed as Tree 58 in the 'City of Boroondara Significant Tree Study' by John Patrick Pty Ltd in 2001, for its attractiveness, age and size. The basic characteristics of the trees are tabulated below.

Tree	Trunk diameter	Height	Health
River Red Gum, <i>Eucalyptus camaldulensis</i>	134 cm	29 m	Very good
Yellow Box, <i>Eucalyptus melliodora</i>	88 cm	20 m	Very good

The trunk diameters were determined by measuring the girth with a tape measure at a height of 1.3 m. The heights were determined using a clinometer, with an expected accuracy of 2 m. The larger diameter quoted in the report by John Patrick Pty Ltd results from measuring over the point where a limb has been lopped. The lower height of 17-18 m quoted in that report appears to be part of a consistent underestimation of tree heights, without the aid of an instrument.

The photographs and the table on the previous page provide a basis for future monitoring of the tree's health. The photograph of the River Red Gum in the report by John Patrick Pty Ltd indicates that there was no visible change between November 2000 and February 2005.

Ecological links with other land

This site is ecologically disconnected from other sites with native vegetation. Typical urban fauna are expected to occur here.

Habitat types

The River Red Gum would originally have been part of a stand of Creekline Grassy Woodland (EVC 68). The Yellow Box would have belonged to Grassy Woodland (EVC 175), probably at the interface with Plains Grassy Woodland (EVC 55).

Site significance rating

The BioSites criteria of the Department of Sustainability & Environment (Amos 2004) do not recognise any biological significance for isolated trees, regardless of their size (except for rare individuals that have particular importance to science). This site therefore has a rating of 'Not significant' by the BioSites criteria.

This should not be taken to imply that these centuries-old trees are not significant when considered against criteria related to heritage or aesthetics.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as the ones of interest here. However, the latest version states, '*Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats*'. The last sentence is not correct in the context of John August Reserve or Boroondara more generally.

Information sources used in this assessment

- A site inspection on 11th February 2005 using this study's standard approach described in Section 2.3.5, including a search for native vegetation, then measuring and photographing the trees and assessing their health;
- The 289-page '*City of Boroondara Significant Tree Study*' by John Patrick Pty Ltd, dated May 2001;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

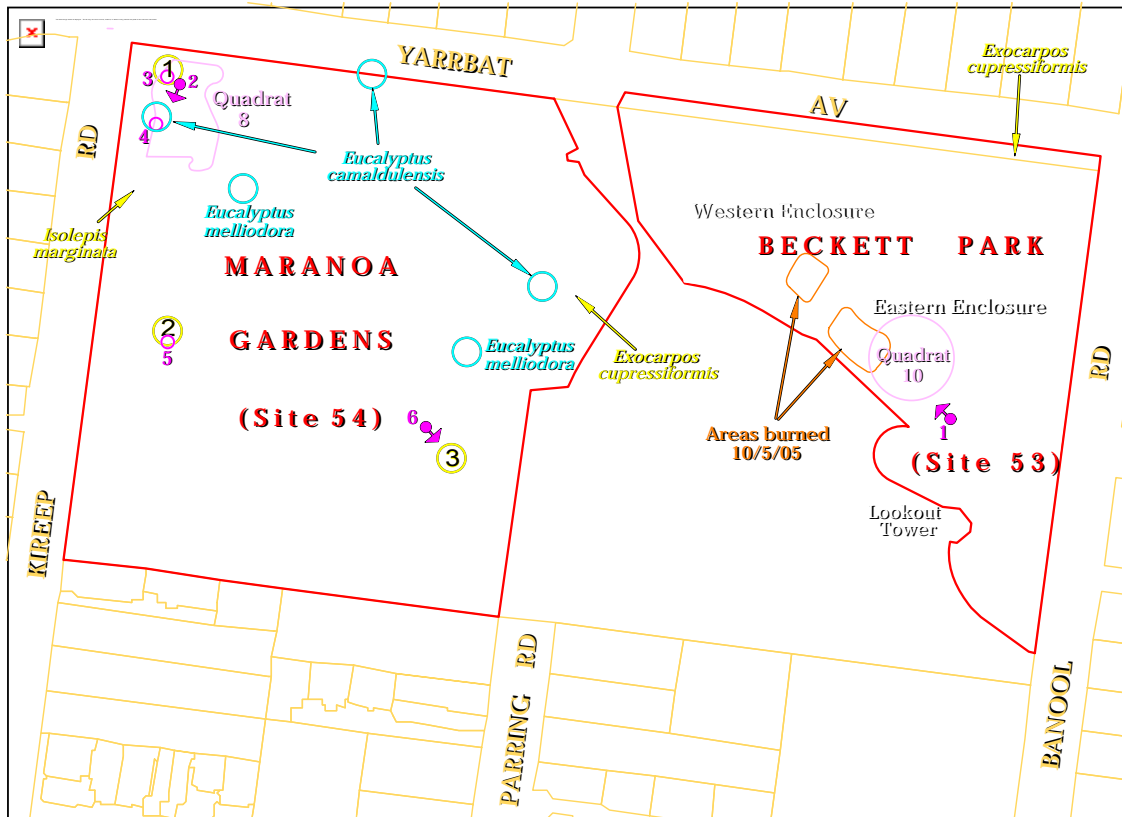
Site 53. Beckett Park, Balwyn

Part of a hilltop park that has natural vegetation and revegetation. Melway ref. 46 G7

Site Biological Significance Level: *State*

Summary of significant natural assets:

- Vegetation grading between the Ecological Vegetation Classes known as Grassy Woodland and Plains Grassy Woodland, both of which are endangered in the bioregion;
- Large numbers of locally threatened plant species, approximately seventeen of them with viable populations.



LEGEND

Scale 1:2,500
10 0 20 40 60 80 100 m



- Numbered photo point
- Numbered upward photo into tree crown
- Numbered Red Gums with trunk diam. >0.8 m
- Remnant eucalypts in Maranoa Gardens with trunk diam. <0.8 m

Boundaries

The site is outlined in red on the aerial photograph above. Part of the site boundary follows the Yarrbat Avenue kerb and the Banool Rd footpath. The two straight-line segments closest to Maranoa Gardens have been positioned to encompass some eucalypts and native grass west of the western fenced enclosure. Most of the remainder of the site boundary follows footpath edges, the exception being a diversion northwest of the lookout tower to enclose all points within ten metres of the trunk of a prominent Yellow Box tree.

Land use & tenure: Council park for amenity and flora conservation.

Physical features

Site area: 1.63 hectaress

Elevation: 103 m to 117 m

Landform: Hilltop and upper slope.

Slope: Flat at the lookout tower, steepening to a maximum of 1:9 north of the tower, with a northerly aspect.

Soil type: Grey-brown coarse sand in a clay matrix. Based on soil maps, the subsoil is grey-brown mottled clay.

Underlying geology: Poorly-consolidated Tertiary sand of the Red Bluff group, deepest at the hilltop (marked by the lookout tower) and getting progressively shallower downhill. The sand probably does not quite reach as far north as Yarrbat Avenue, where the Geological Survey of Victoria map shows it giving way to the underlying Silurian sedimentary rock of the Andersons Creek formation, which is dominated by siltstone.

Site description

Beckett Park is one of Boroondara's most biologically significant sites, because of the large number of indigenous plant species present that are very rare in Melbourne's inner or middle suburbs. However, many of these species are in decline.

After the purchase of the land for a park in c. 1916, any indigenous trees and shrubs that remained were cleared and the park was developed with lawns, amenity plantings, monuments and a path network in the European style of the day. Some of the plantings are now listed by the National Trust, but these are not of conservation significance and therefore not included in the site circumscribed here.

Through seventy or eighty years of mowing, a substantial number of indigenous plants persisted in the part of the park that is included within the site outlined on the aerial photograph. As native vegetation disappeared from the district generally, the importance of the native vegetation within the park rose. Mowing ceased in part of the site around 1990, allowing some indigenous trees to grow up among the planted trees. Two fenced enclosures were created to provide an indigenous flora sanctuary in about 1990, outlined in white on the aerial photograph. These enclosures include most of the site's native vegetation, the other main area being to the southeast of the commemorative lookout tower that is marked on the aerial photograph. It is important to note that several significant plant species occur only, or predominantly, outside the enclosures. It is particularly important that the area southwest of the lookout tower be managed with proper recognition of its botanical significance.

Beginning around 1994, the more ecologically degraded parts of the fenced enclosures were mulched and revegetated with plants that are indigenous to Boroondara and surrounding areas, though not always ecologically suited to the site.

Because of the significance of Beckett Park's indigenous vegetation, there have been three botanical studies conducted: Carr *et al.* (1989), Carr & Peake (1995) and a 1987 survey by David Cameron and others for a state government report (abandoned before publication) on Melbourne's indigenous vegetation. The park's native vegetation was also taken into account in the *Maranoa Gardens and Beckett Park Masterplan* of 1996. Full bibliographic details of these reports appear on p. 416.

The 1989 and 1994 reports both warned that the park's significant plant species were in decline. The monitoring data reported below confirms that this has been the case, with several significant plant species having apparently disappeared since the late 1980s. Most of the affected species are unable to regenerate without fire.

Ecological links with other land

Beckett Park adjoins Maranoa Gardens (Site 54). Any native fauna species present in one of these two sites is likely to be present in the other site, at least occasionally. The pollen of most indigenous plant species would also be exchanged between the sites, thereby reducing inbreeding.

Taken as a pair, these sites are rather ecologically isolated from other areas of native vegetation. Most of the fauna recorded are typical of residential areas in Melbourne's eastern suburbs. However, the presence of certain bird species, such as robins and Gang-gang Cockatoos, suggests that the pair of sites plays a (probably minor) role as an ecological stepping-stone for such nomadic species.

Habitat type

The native vegetation in the vicinity of the lookout tower in Beckett Park is substantially modified from a natural state, but it shows some strong signs of deriving from Grassy Woodland (EVC 175). However, it also has affinities to Plains Grassy Woodland (EVC 55). Further down the hill, the signs of Grassy Woodland gradually diminish, and by Yarrbat Avenue, the vegetation is not distinguishable from Plains Grassy Woodland. Past clearing and the effects of nearly a century of management as an amenity park have made delineation between these EVCs in Beckett Park impossible.

Both Grassy Woodland and Plains Grassy Woodland are **endangered** in the Gippsland Plain bioregion.

The structure and composition of the vegetation are summarised as follows:

Canopy trees: Dominated by *Eucalyptus camaldulensis* to 20 m tall, with far fewer *Eucalyptus melliodora* (mainly at higher elevations). Grassy Woodland would normally have abundant *Eucalyptus melliodora*, which may have applied to Beckett Park prior to the hill being cleared.

Lower trees: *Acacia mearnsii* is abundant and *Acacia implexa* is scattered. The former is a more common feature of Grassy Woodland than Plains Grassy Woodland. There is also a single *Exocarpos cupressiformis* beside Yarrbat Av.

Shrubs: *Acacia pycnantha* is abundant in several patches, concentrated near the hilltop.

Vines and ferns: There are approximately five plants of *Glycine ?tabacina* near the Banool Rd fence.

Ground flora: Dominated around the hilltop by many *Austrodanthonia* species (particularly *Austrodanthonia racemosa*), also with abundant *Cotula australis*, *Crassula decumbens* and *Crassula sieberiana*. The last of these species is a good indicator of Grassy Woodland as opposed to Plains Grassy Woodland, as are the somewhat less abundant species *Austrostipa mollis* and *Lomandra nana*. These species become progressively less abundant down the slope, with *Themeda triandra* becoming dominant in the ground flora in Quadrat 10 and points further north. *Lomandra filiformis* subsp. *coriacea*, *Microlaena stipoides* and *Gonocarpus tetragynus* are abundant throughout. Less abundant species that serve as good ecological indicators include *Leptorhynchos squamatus*, *Dichelachne crinita*, *Einadia nutans*, *Pimelea curviflora* and *Pimelea humilis*.

Habitat Score

A habitat score was determined using the habitat hectare method (Section 2.3.4, page 13) for the combination of the two enclosures (excluding revegetation areas) and the native vegetation southwest of the lookout tower. This area measures approximately 0.85 ha and is ecologically fairly uniform.

The habitat score measured on 24/12/04 was 32%, or 35% if the canopy cover of planted non-indigenous eucalypts is scored as if those trees were indigenous. The argument in favour of the higher score is that the planted eucalypts are having similar effects on soil nutrients, soil moisture, shade, organic litter and services to wildlife as the original indigenous species would have done.

A score of either 32% or 35% qualifies the vegetation as 'High' conservation significance under *Victoria's Native Vegetation Framework* (NRE 2002a), taking into account that the vegetation belongs to an endangered EVC.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Last Record	Notes
<u>Vulnerable throughout Victoria</u>			
Endangered	<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	2005	Part of the original wild individual was dug up for propagation some years ago. One of the progeny was then planted into the western enclosure. One plant re-appeared naturally in 2005 in the east, following fire.
<u>Rare or Threatened throughout the Melbourne Area</u>			
Extinct	<i>Triptilodiscus pygmaeus</i>	1987	Recorded as moderately common in 1987.
Extinct	<i>Vittadinia muelleri</i>	1987	Recorded as scarce in 1987.
Critically Endangered	<i>Lomandra nana</i>	1989	Recorded as scarce in 1987 and 1989.
Critically Endangered	<i>Glycine ?tabacina</i>	2005	Approximately 5 plants near Banool Rd, threatened by <i>Ehrharta erecta</i> , <i>Galium aparine</i> and <i>Vicia hirsuta</i> .
<u>Not Rare or Threatened throughout the Melbourne Area</u>			
Extinct	<i>Chamaescilla corymbosa</i>	1989	Recorded as scarce in 1989.
Extinct	<i>Diuris pardina</i>	1987	Recorded as scarce in 1987.
Extinct	<i>Astroloma humifusum</i>	1987	Recorded as scarce in 1987.
Critically Endangered	<i>Austrodanthonia carphoides</i>	1989	Recorded as scarce in 1989; possibly misidentified.
Critically Endangered	<i>Burchardia umbellata</i>	2004	Five in the western enclosure and six in the east.
Critically Endangered	<i>Dichelachne sciurea</i> spp. agg.	1987	Recorded as scarce in 1987.
Critically Endangered	<i>Hypoxis vaginata</i>	2004	Four individuals found, SE of the western enclosure.
Critically Endangered	<i>Wurmbea dioica</i>	2004	>10 in the western enclosure.
Critically Endangered	<i>Exocarpos cupressiformis</i>	2005	One sickly individual beside Yarrbat Avenue.
Critically Endangered	<i>Kennedia prostrata</i>	1994	Recorded as fairly numerous in 1994.
Critically Endangered	<i>Leptorhynchos squamatus</i>	2005	Fairly numerous, some natural and some planted.
Critically Endangered	<i>Pimelea curviflora</i>	2005	Moderate numbers in the eastern enclosure.
Critically Endangered	<i>Pimelea humilis</i>	2005	Moderate numbers in the eastern enclosure.
Critically Endangered	<i>Plantago varia</i>	1989	Recorded as moderately common in 1987.

Conservation Status in Boroondara	Species Name	Last Record	Notes
Endangered	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	2005	Very small numbers in each enclosure.
Endangered	<i>Luzula meridionalis densiflora</i>	2005	Very scarce, in the eastern enclosure.
Endangered	<i>Microtis ?unifolia</i>	1994	Recorded as scarce in 1994; possibly misidentified.
Endangered	<i>Thelymitra peniculata</i>	2004	Several tens of individuals in the eastern enclosure.
Endangered	<i>Asperula conferta/scoparia</i>	2004	Several individuals in the northeastern corner. Recorded by Carr & Peake (1995) as <i>A. scoparia</i> , but probably closer to <i>A. conferta</i> .
Endangered	<i>Atriplex semibaccata</i>	2004	One individual, in Quadrat 10.
Endangered	<i>Bossiaea prostrata</i>	2004	Twelve individuals in the eastern enclosure.
Endangered	<i>Drosera peltata</i> subsp. <i>peltata</i>	2004	Moderate numbers in the eastern enclosure.
Endangered	<i>Solanum laciniatum</i>	2004	Proliferating from plantings in both enclosures.
Endangered	<i>Veronica gracilis</i>	2004	Several individuals, present in both enclosures.
Endangered	<i>Wahlenbergia gracilis</i>	1989	Recorded as scarce in 1987 and 1989.
Vulnerable	<i>Austrodanthonia eriantha</i>	2005	Moderate numbers, widespread.
Vulnerable	<i>Austrodanthonia geniculata</i>	1994	Recorded as abundant in 1994, but found only in Maranoa Gardens in 2004.
Vulnerable	<i>Austrodanthonia laevis</i>	2004	Moderate numbers in the eastern enclosure.
Vulnerable	<i>Austrodanthonia penicillata</i>	2004	Moderate numbers in both enclosures.
Vulnerable	<i>Austrodanthonia pilosa</i>	1989	Recorded as fairly numerous in 1989, but possibly a misidentification of <i>Austrodanthonia penicillata</i> .
Vulnerable	<i>Austrodanthonia tenuior</i>	2004	Only one or two plants found.
Vulnerable	<i>Austrostipa ?semibarbata</i>	1989	Recorded as scarce in 1989; possibly misidentified.
Vulnerable	<i>Carex breviculmis</i>	2004	Moderate numbers, mainly in the eastern enclosure.
Vulnerable	<i>Juncus pallidus</i>	2004	Perhaps only the progeny of planted plants.
Vulnerable	<i>Microtis parviflora</i>	2004	Numerous in the eastern enclosure.
Vulnerable	<i>Poa morrisii</i>	2005	Abundant and widespread within the site.
Vulnerable	<i>Schoenus apogon</i>	2004	Moderate numbers in the western enclosure.
Vulnerable	<i>Acacia pycnantha</i>	2005	Localised but abundant.
Vulnerable	<i>Acaena agnipila</i>	2004	Moderate numbers in the eastern enclosure.
Vulnerable	<i>Eucalyptus melliodora</i>	2005	Small numbers in, and north of, the eastern enclosure.
Vulnerable	<i>Euchiton collinus</i>	1987	Recorded as scarce in 1987.
Vulnerable	<i>Gonocarpus tetragynus</i>	2005	Numerous in the eastern enclosure; also present on the hilltop.
Vulnerable	<i>Solenogyne dominii</i>	1994	Recorded in moderate numbers in 1994.
Data Deficient	<i>Austrodanthonia caespitosa</i>	2004	At most several individuals, in the western enclosure.
Data Deficient	<i>Carex inversa</i>	2004	Scarce, in the western enclosure.
Data Deficient	<i>Crassula sieberiana</i> s.l.	2005	Fairly abundant southeast of the lookout tower.
Data Deficient	<i>Hypnum cupressiforme</i>	2004	Numerous in both enclosures.
Data Deficient	<i>Macrocoma tenuis</i>	2004	A small amount found, precise location not recorded.
Data Deficient	<i>Heteroscyphus</i> sp.	2004	A small amount found in Quadrat 10.

A record of *Lomandra glauca* from Quadrat 10 of the report by Carr and Peake (1995) is regarded here as unreliable for ecological reasons and because the same report's aggregate list for the whole site excluded this species. Similarly, the record of *Wahlenbergia gracilentia* in the same report was claimed to be from Carr *et al.* (1989), but there was no such record in the earlier report. Several other records have been omitted for similar reasons. Attempts to clarify such records with their original source were unsuccessful.

Full flora list

The table below lists the plant species recorded in the site, excluding planted species that no longer exist and non-indigenous specimen trees that are ecologically benign. The numbered columns correspond to the following areas:

1 = The western fenced enclosure; 2 = The eastern fenced enclosure; 3 = Outside either enclosure.

Species with underlined names represent valuable seed resources, at least for some purposes.

In the grid squares:

D = the species is dominant in its vegetation stratum;

M = many plants were found in 2004-5;

X = Not found in 2004-5, but recorded previously;

✓ = moderate numbers were recorded in 2004-5; and

– = very few plants were recorded in 2004-5.

Species without an entry in any column were recorded only in 1987, at an unknown location.

Species Name	Area			Species Name	Area			Species Name	Area						
	1	2	3		1	2	3		1	2	3				
Indigenous species															
<i>Acacia implexa</i>	✓	✓	–	<i>Juncus pallidus</i>			–	<i>Arctotheca calendula</i>	✓	✓					
<i>Acacia mearnsii</i>	D	D	D	<i>Kennedia prostrata</i>	X	X		<i>Aster subulatus</i>	X						
<i>Acacia melanoxydon</i>	–			<i>Leptorhynchus squamatus</i>		✓		<i>Briza maxima</i>	X						
<i>Acacia pycnantha</i>		✓	D	<i>Lomandra filiformis coriacea</i>	M	M	✓	<i>Briza minor</i>	✓	✓					
<i>Acaena agnipila</i>		✓		<i>Lomandra filiformis filiformis</i>	–	X	–	<i>Bromus catharticus</i>	✓	X					
<i>Arthropodium strictum</i>	M	M	–	<i>Lomandra nana</i>			X	<i>Bromus diandrus</i>	X	✓	✓				
<i>Asperula conferta/scoparia</i>		✓		<i>Luzula meridionalis densiflora</i>				<i>Bromus hordeaceus</i>		✓					
<i>Astroloma humifusum</i>			X	<i>Macrocoma tenuis</i>	–			<i>Centaurium erythraea</i>	X	✓					
<i>Atriplex semibaccata</i>		–		<i>Microlaena stipoides</i>	M	M	✓	<i>Centaurium tenuiflorum</i>		✓					
<i>Austrodanthonia caespitosa</i>	–	X		<i>Microtis parviflora</i>		M		<i>Cerastium glomeratum</i>	✓	✓					
<i>Austrodanthonia carphoides</i>		X		<i>Microtis unifolia</i>	X	X		<i>Coprosma repens</i>	–						
<i>Austrodanthonia eriantha</i>	✓	✓	✓	<i>Muellerina eucalyptoides</i>	✓			<i>Cotoneaster pannosus</i>		X					
<i>Austrodanthonia fulva</i>	✓	M	M	<i>Oxalis exilis/perennans</i>	✓	M	✓	<i>Cynodon dactylon</i>	✓	✓					
<i>Austrodanthonia geniculata</i>	X	X	✓	<i>Pimelea curviflora</i>		✓		<i>Cyperus tenellus</i>	✓						
<i>Austrodanthonia laevis</i>		✓		<i>Pimelea humilis</i>		✓		<i>Dactylis glomerata</i>	✓	✓	✓				
<i>Austrodanthonia penicillata</i>	✓	✓		<i>Plantago varia</i>			X	<i>Ehrharta erecta</i>	X	M	✓				
<i>Austrodanthonia ?pilosa</i>		X		<i>Poa morrisii</i>	✓	✓	✓	<i>Ehrharta longiflora</i>	✓	✓	✓				
<i>Austrodanthonia racemosa</i>	M	M	D	<i>Schoenus apogon</i>	✓	X		<i>Festuca arundinacea</i>	X						
<i>Austrodanthonia setacea</i>	✓	✓	✓	<i>Senecio quadridentatus</i>		✓		<i>Foeniculum vulgare</i>	X						
<i>Austrodanthonia tenuior</i>		–		<i>Solanum laciniatum</i>	✓	✓		<i>Fraxinus angustifolia</i>	X						
<i>Austrostipa mollis</i>		✓	✓	<i>Solenogyne dominii</i>	X	X		<i>Freesia alba × leichlinii</i>	X						
<i>Austrostipa ?semibarbata</i>			X	<i>Thelymitra peniculata</i>		✓		<i>Galium aparine</i>		✓					
<i>Bossiaea prostrata</i>		✓		<i>Themeda triandra</i>	D	D	✓	<i>Gamochaeta purpurea</i>	X	✓					
<i>Burchardia umbellata</i>	–	–		<i>Tricoryne elatior</i>	M	M		<i>Holcus lanatus</i>	X						
<i>Carex breviculmis</i>	–	✓		<i>Triptilodiscus pygmaeus</i>			X	<i>Hypochoeris glabra</i>	X	X					
<i>Carex inversa</i>	–			<i>Veronica gracilis</i>	✓	✓		<i>Hypochoeris radicata</i>	✓	✓					
<i>Cassinia arcuata</i>	–			<i>Vittadinia muelleri</i>			X	<i>Ixia polystachya</i>	–						
<i>Chamaescilla corymbosa</i>	X	X		<i>Wahlenbergia gracilis</i>	X			<i>Juncus capitatus</i>		✓					
<i>Cotula australis</i>		X	M	<i>Wurmbea dioica</i>	✓	X	X	<i>Leontodon taraxacoides</i>	X	X					
<i>Crassula decumbens</i>		X	M	Planted species											
<i>Crassula sieberiana</i> s.l.			M	<i>Acacia pycnantha</i>		✓		<i>Lepidium africanum</i>		✓					
<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	–			<i>Leptorhynchus squamatus</i>		–		<i>Lolium perenne</i>	X	X					
<i>Dichelachne sciurea</i> spp agg				<i>Acacia implexa</i>	✓			<i>Oxalis purpurea</i>	X	X					
<i>Dichelachne crinita</i>	✓	✓	✓	<i>Bulbine bulbosa</i>		✓		<i>Paspalum dilatatum</i>	✓	✓					
<i>Dichondra repens</i>	–			<i>Chrysocephalum apiculatum</i>	–			<i>Pennisetum clandestinum</i>		X					
<i>Diuris pardina</i>				<i>C. semipapposum</i>	–			<i>Petrorhagia</i> sp.		X					
<i>Drosera peltata peltata</i>	X	✓		<i>Goodenia ovata</i>	✓	✓		<i>Pittosporum undulatum</i>	X						
<i>Einadia nutans</i>			✓	<i>Juncus pallidus</i>	✓			<i>Plantago coronopus</i>	X	X					
<i>Elymus scaber</i>		✓	✓	<i>Kunzea ericoides</i> s.l.	✓			<i>Plantago lanceolata</i>	✓	✓					
<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>		✓		<i>Leptorhynchus squamatus</i>		✓		<i>Poa annua</i>	X	X					
<i>Epilobium hirtigerum</i>		✓		<i>Lomandra longifolia</i>		✓		<i>Polycarpon tetraphyllum</i>		X					
<i>Eragrostis brownii</i>	X	X		<i>Ozothamnus ferrugineus</i>		✓		<i>Populus ×canescens</i>		X					
<i>Eucalyptus camaldulensis</i>	D	D	D	<i>Senecio quadridentatus</i>	✓			<i>Prunus cerasifera</i>	X						
<i>Eucalyptus melliodora</i>		✓	–	<i>Stylidium armeria</i>		✓		<i>Romulea rosea</i>	M	M					
<i>Euchiton collinus</i>				<i>Xerochrysum viscosum</i>		✓		<i>Silene</i> sp.	X						
<i>Exocarpos cupressiformis</i>			–	Weed species											
<i>Geranium</i> sp.		–		<i>Acacia elata</i>		X		<i>Sonchus oleraceus</i>	–	–					
<i>Glycine ?tabacina</i> s.l.		✓		<i>Acacia longifolia longifolia</i>		✓	✓	<i>Sparaxis bulbifera</i>	–						
<i>Gonocarpus tetragynus</i>	X	M	–	<i>Acacia saligna</i>		X		<i>Sporobolus africanus</i>	M	✓					
<i>Heteroscyphus</i> sp.		✓		<i>Acer pseudoplatanus</i>	X			<i>Stellaria media</i>		X					
<i>Hypnum cupressiforme</i>	M	M		<i>Agrostis capillaris</i>	✓	✓	✓	<i>Taraxacum officinale</i> spp. agg.	X						
<i>Hypoxis vaginata</i>	–			<i>Airca caryophyllea</i>	✓	✓		<i>Tradescantia fluminensis</i>	✓	–					
<i>Juncus bufonius</i>		X		<i>Airca elegantissima</i>	✓			<i>Trifolium dubium</i>	X						
				<i>Anthoxanthum odoratum</i>	✓	M		<i>Trifolium glomeratum</i>	X	X					
								<i>Trifolium repens</i>		X					
								<i>Trifolium subterraneum</i>	X	X					
								<i>Veronica hederifolia</i>	X						

Vicia hirsuta *Vulpia bromoides* *Vulpia myuros* **Fauna of special significance**

The significant fauna species in the list below have been observed at Beckett Park and Maranoa Gardens. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status			Species Name	Last Record	Notes
Victoria	Melbourne	Boroondara			
Vulnerable		Secure	Grey-headed Flying-fox	2004	Typical suburban record.
	Endangered	Occasional Visitor	Cockatiel	1995	Vagrant or escapee.
	Near Threatened	Occasional Visitor	Peregrine Falcon	2004	
	Rare	Occasional Visitor	Pink Robin	2004	
		Critically Endangered	Short-beaked Echidna	2002	Vagrant.
		Endangered	Southern Bullfrog	2002	Died out during drought.
		Endangered	Southern Brown Tree Frog	2004	
		Endangered	Crimson Rosella	2004	
		Endangered	Spotted Pardalote	2004	
		Endangered	Crested Shrike-tit	2004	
		Vulnerable	White-striped Freetail Bat	2004	
		Vulnerable	Little Pied Cormorant	1996	Vagrant.
		Vulnerable	Brown Goshawk	2004	
		Vulnerable	Australian Hobby	2004	
		Vulnerable	Yellow-tailed Black-	2004	Seen feeding early 2005.
		Vulnerable	Musk Lorikeet	2004	
		Vulnerable	Eastern Rosella	2004	
		Vulnerable	Tawny Frogmouth	1996	
		Vulnerable	Laughing Kookaburra	2004	
		Vulnerable	White-browed Scrubwren	2004	
		Vulnerable	New Holland Honeyeater	2004	
		Vulnerable	Eastern Spinebill	2004	
		Vulnerable	Grey Shrike-thrush	1988	
		Vulnerable	Grey Fantail	2004	
		Vulnerable	Black-faced Cuckoo-shrike	2004	
		Vulnerable	Mistletoebird	2004	
		Occasional Visitor	Little Eagle	2002	Vagrant.
		Occasional Visitor	Nankeen Kestrel	2004	
		Occasional Visitor	Common Bronzewing	1997	
		Occasional Visitor	Gang-gang Cockatoo	2004	
		Occasional Visitor	Southern Boobook	2004	
		Occasional Visitor	White-eared Honeyeater	2004	
		Occasional Visitor	Striated Thornbill	1999	
		Occasional Visitor	Flame Robin	1999	
		Occasional Visitor	Scarlet Robin	1995	
		Occasional Visitor	Flame Robin	2004	
		Occasional Visitor	Rufous Whistler	1999	
		Occasional Visitor	Grey Currawong	2004	

Full fauna list

The following list is an aggregate of fauna records for Beckett Park and Maranoa Gardens. Any species found in one of these sites is likely to also occur in the other site, at least occasionally. The year of the most recent sighting of each species is shown. Asterisks indicate introduced species and obelisks (†) indicate that breeding was confirmed.

Butterflies

Australian Painted Lady	2005
*Cabbage White	2005
Caper White	2005
Common Brown	2005
Common Grass-blue	2005
Dingy Swallowtail	2005
Pea Blue	2004
Yellow-banded Dart	2005

Reptiles

Garden Skink	2004
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Mammals

Short-beaked Echidna	2002
Common Brushtail Possum	2005
Common Ringtail Possum	2004
Grey-headed Flying-fox	2004
White-striped Freetail Bat	2004
*Red Fox	2004

Frogs

Southern Bullfrog	2002
Southern Brown Tree Frog	2004

Birds

Australian Wood Duck	1998
Pacific Black Duck	2004
Little Pied Cormorant	1996
Australian White Ibis	1994
Brown Goshawk	2004
Little Eagle	2002

Australian Hobby	2004	Tawny Frogmouth	2005	Grey Shrike-thrush	1988
Peregrine Falcon	2004	Laughing Kookaburra	2005	Magpie-lark	2005
Nankeen Kestrel	2004	Spotted Pardalote	2004	Grey Fantail	2004
*Rock Dove	2004	White-browed Scrubwren	2004	Willie Wagtail	2004
*Spotted Turtle-Dove	2004	Brown Thornbill	2004	Black-faced Cuckoo-shrike	2004
Common Bronzewing	1997	Striated Thornbill	1999	Grey Butcherbird	2004
Yellow-tailed Black-Cockatoo	2005	†Red Wattlebird	2004	†Australian Magpie	2005
Gang-gang Cockatoo	2004	†Brush Wattlebird	2004	Pied Currawong	2004
Galah	2004	†Noisy Miner	2005	Grey Currawong	2004
Sulphur-crested Cockatoo	2004	White-eared Honeyeater	2004	†Little Raven	2004
Cockatiel	1998	White-plumed Honeyeater	2004	*House Sparrow	2004
Rainbow Lorikeet	2005	New Holland Honeyeater	2004	Mistletoebird	2004
Musk Lorikeet	2005	Eastern Spinebill	2004	Welcome Swallow	2004
Little Lorikeet	2005	Scarlet Robin	1995	Silvereye	2004
Crimson Rosella	2005	Flame Robin	2004	*Common Blackbird	2004
Eastern Rosella	2004	Pink Robin	2004	*Song Thrush	2004
Southern Boobook	2004	Crested Shrike-tit	2004	*Common Starling	2004
		Rufous Whistler	1999	*Common Myna	2004

Ten additional bat species appear in two lists in the report by Carr & Peake (1995), none of them with any entry in the columns that indicate where the species was found. The report also states clearly in two places that there were only four indigenous mammal species detected, which matches the number in that report's data tables if the ten bat species are discounted. It appears likely that these bat species were erroneously included in the 1995 report.

Bird census results

David Lockwood carried out a twenty-minute bird census in Beckett Park as part of his bird survey on 18/10/04. He recorded six native species and three introduced species. The species with the highest counts were Red Wattlebird (11), Rainbow Lorikeet (3), Rock Dove (3), Brown Thornbill (2) and Brush Wattlebird (2). Both the number of species and the particular species observed were typical for a treed residential area. However, note that the table above includes recent records of less common species such as the Gang-gang Cockatoo, White-eared Honeyeater, Flame Robin, Pink Robin and Crested Shrike-tit. These less common species suggest that Beckett Park and the adjacent Maranoa Gardens represent an island of habitat that serves as an ecological stepping-stone for movements of some bird species that are nomadic through Boroondara.

A comparison with results of bird censuses in 1994 is given on page 415.

Fauna habitat

The presence of River Red Gums and scattered shrubs provide ideal habitat for the Red Wattlebird. This is undesirable because the Red Wattlebird is aggressive and chases away smaller insect-eating birds that would otherwise help control insect pests on the indigenous shrubs and trees. The Brown Thornbill frequents areas where the Red Wattlebird is less prevalent. Flowering Grevilleas near the boundary with Maranoa Gardens are utilised by the Eastern Spinebill and Red Wattlebird. Australian Magpies and Little Ravens were observed nesting in River Red Gums, while Red Wattlebirds were nesting in a planted Lilly-Pilly and Brush Wattlebirds were nesting in a planted paperbark. A Common Ringtail Possum drey was also found in a planted paperbark. The lookout tower acts as a roosting site for the Rock Dove.

The presence of mistletoe indicates Mistletoebird frequents the area, but none was observed during the survey period.

The dense, grassy ground flora with scattered sparse patches provides habitat that would suit hardy lizards such as the Garden Skink (which is the only species of reptile recorded in the park in recent decades). The grasses were also observed to be heavily populated with butterflies.

Site significance ratings

Beckett Park is site number 3532 in the Department of Sustainability & Environment's BioSite database. The significance level given in the BioSites database is 'Regional', but this was based on information and criteria from the 1990s that are now obsolete. The following is an assessment against the current BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), any native vegetation belonging to an endangered EVC such as Grassy Woodland or Plains Grassy Woodland, and which has a habitat score less than 40% (as determined for Beckett Park – see above), has a conservation significance rating of High.

This translates to **State** significance under BioSites criterion 3.2.3, noting that the size and native vegetation cover of the Beckett Park native vegetation easily meet the requirements of this criterion.

Rare or threatened plants

Dianella sp. aff. *longifolia* (Benambra) is endangered in Victoria and it is not endemic to Victoria. As such, the plants of this species (planted and natural) in Beckett Park are of **Regional** significance under BioSites criterion 3.1.2.

Approximately seventeen of the locally threatened plant species listed under the heading 'Flora of special significance' have viable populations at Beckett Park. Each of these populations gives the site **Local** significance under BioSites criterion 3.1.5.

In addition, *Exocarpos cupressiformis* is such a rare species in Boroondara that the one in Beckett Park (like the nearby one in Maranoa Gardens) could be regarded as an 'important site or population of the taxon in the local area' in the sense of BioSites criterion 3.1.5, and thereby represents **Local** significance.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
<p>Environmental weeds. The species of concern are:</p> <ul style="list-style-type: none"> • Serious: Sweet Vernal-grass (<i>Anthoxanthum odoratum</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Cleavers (<i>Galium aparine</i>), Cat's Ear (<i>Hypochoeris radicata</i>); • Moderately serious: Sallow Wattle (<i>Acacia longifolia</i> subsp. <i>longifolia</i>), Brown-top Bent (<i>Agrostis capillaris</i>), Silvery Hair-grass (<i>Aira caryophylla</i>), Elegant Hair-grass (<i>Aira elegantissima</i>), Cape Weed (<i>Arctotheca calendula</i>), Lesser Quaking-grass (<i>Briza minor</i>), Great Brome (<i>Bromus diandrus</i>), Soft Brome (<i>Bromus hordeaceus</i> subsp. <i>hordeaceus</i>), Common Mouse-ear Chickweed (<i>Cerastium glomeratum</i> s.l.), Couch (<i>Cynodon dactylon</i>), Cocksfoot (<i>Dactylis glomerata</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Spiked Cudweed (<i>Gamochaeta purpurea</i>), Variable Ixia (<i>Ixia polystachya</i>), Common Pepper-cress (<i>Lepidium africanum</i>), Paspalum (<i>Paspalum dilatatum</i>), Ribwort (<i>Plantago lanceolata</i>), Common Onion-grass (<i>Romulea rosea</i>), Sparaxis (<i>Sparaxis bulbifera</i>), Indian Rat-tail Grass (<i>Sporobolus africanus</i>), Squirrel-tail Fescue (<i>Vulpia bromoides</i>), Tiny Vetch (<i>Vicia hirsuta</i>), Rat's-tail Fescues (<i>Vulpia</i> spp.). 	All	High	Current
Exclusion of fire (or alternative management prescriptions), thereby failing to regenerate indigenous plants. In recognition of this risk, part of each enclosure was burned on 10/5/05 (see map, page 405).	Significant plant species; (Plains) Grassy Woodland	High	Current
Precariously small populations of many indigenous plant species (those with only dashes in the grid cells in the list headed 'Full flora list' above), making them vulnerable to inbreeding or other threats.	Locally threatened plant species	Moderate	Current
Displacement of small native birds by the aggressive Red Wattlebird.	Birdlife; Tree health	Moderate	Current
Dog-walking: (a) nutrient changes in soil due to faeces; and (b) trampling and scratching of ground flora.	(Plains) Grassy Woodland	Low to moderate	Current
Eucalypt dieback disease due to possums, psyllids, leaf skeletonisers, leaf miners, galls or other causes.	(Plains) Grassy Woodland	Low	Current

Priority actions

1. An ecological burn was conducted on 10th May 2005, in the two areas depicted on the aerial photograph on page 405. Autumn burns such as this can promote very serious proliferation of annual weeds and Sweet Vernal-grass, except that in this case, the areas are being monitored and corrective measures are being taken. Continuation of this vigilance and weed control is of **very high** importance from the perspective of the whole municipality.

2. Conduct a flora survey of at least one of the two burned areas during 2006 and again in 2008. If the burn is found to have been effective in promoting the regeneration of indigenous flora (regardless of what happens to weeds), promptly arrange a burn elsewhere within the site. The burn must be done in spring (preferably October) and as hot as safety will allow, thereby disadvantaging regeneration of annual weeds and Sweet Vernal-grass. Cut the grass in advance and allow it to dry out, to make burning easier under safe weather conditions. The importance of this action is high from the perspective of the whole municipality.
3. Control *Ehrharta erecta*, *Ehrharta longiflora* and *Anthoxanthum odoratum* with grass-specific herbicide within approximately ten metres of the eastern fence of the eastern enclosure, particularly around the cluster of *Glycine* plants. For *Anthoxanthum odoratum* and *Ehrharta longiflora* (and other annual grass weeds), use the herbicide label's specified application rate for annual grasses, and apply when the *Ehrharta longiflora* plants mostly have three to five leaves (typically late July). For *Ehrharta erecta*, the stronger application rate required will necessitate more careful avoidance of indigenous grasses, combined with hand weeding. *Galium aparine* and *Vicia hirsuta* threaten to take over from the grass weeds, so remove them by hand in the following September-October (particularly near the *Glycine* plants). If this approach is found successful, consider wider application.
The urgency of this action is high and the importance is moderate from the perspective of the whole municipality.
4. Provide signs to alert dog owners to the State significance of vegetation in the eastern enclosure, and the damage being done by dogs. The signs should ask people to avoid walking their dogs within the enclosure. The importance and urgency of this action are moderate from the perspective of the whole municipality.
5. Act on the recommendation of Carr *et al.* (1989) to collect and store seed of plant species that are at risk of disappearing from the park. A fraction of the seed taken should be propagated as soon as practicable and planted back into the park (or exchanged with plants propagated from nearby sites). Such planting would be consistent with the existing program of 'enrichment plantings' that have been occurring in the park in the last few years. The importance and urgency of this action are moderate from the perspective of the whole municipality.

Past management and revegetation

See 'Site description' on page 329. In addition, an ecological burn was conducted on 10th May 2005, extending from Quadrat 10 into the southeastern corner of the western enclosure. This occurred after the area was surveyed for this report.

Future revegetation

As noted in Priority action 4 above, it would be desirable to continue the recent enrichment plantings in conjunction with a program for conserving seed of species that are at risk of disappearance from the park.

For the short term, the only revegetation that will be important is if particularly weedy patches within the enclosures are to be rehabilitated. 'Table 3' of Carr and Peake (1995) provides suggestions for suitable species; however it is safest to confine the species chosen to those already present on site or that appear in the lists in Appendix C for Grassy Woodland or Plains Grassy Woodland.

Monitoring of past change

Quadrats

Carr *et al.* (1989) surveyed seven quadrats in Beckett Park, numbered 1 to 7 in their report (or E13351 to E13357 in the Department of Sustainability & Environment's Flora Information System). Quadrats 2 and 3 were re-surveyed in 1994 for the report by Carr and Peake (1995), and an additional 'Quadrat 10' was surveyed. (Quadrats 8 and 9 are in Maranoa Gardens.) The locations of the quadrats were marked on a map in the latter report, but only very roughly. For example, Quadrat 1 is shown on the map to be an area of treeless lawn, whereas the plant species in the data table indicate an area of native vegetation with eucalypts, wattles and sensitive ground flora such as *Kennedia prostrata* and *Arthropodium strictum*. Perhaps the imprecise mapping was a reason why the 1994 botanical survey only revisited two of the original seven quadrats.

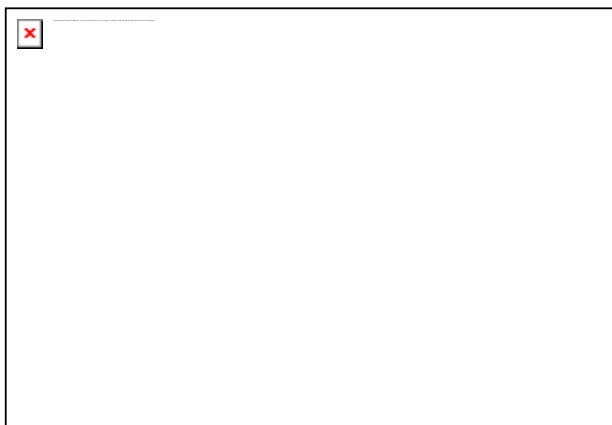
Inconsistencies in the 1995 report's quadrat data creates additional problems for monitoring; e.g. the 1995 report ostensibly reproduced the 1989 data, but there are some important differences; and some of the more dubious species in the 1995 quadrat lists are not included in the aggregate list for all quadrats.

Because of these problems, only one of Carr & Peake's quadrats (Quadrat 10) was re-surveyed for the present study. This quadrat was two to nine times larger than any other quadrat, and is the one best located to monitor change in the park's higher quality native vegetation. Its location is mapped to an accuracy of ± 2 m on the aerial photograph on page 405. The quadrat area on Carr & Peake's map is less than 300 m², but was stated to be 700 m² in their text. A circle of 30 m diameter (707 m² in area) was used in 2004, consistent with Carr's normal practice.

Photo 1a below shows the quadrat on 24/11/94, reproduced from Carr & Peake (1995). Photo 1b is the closest match that could be obtained on 24/12/04. The change in the ground flora density between the two photographs' foregrounds is probably partly attributable to the 'extremely dry season' that Carr & Peake describe for the 1994 fieldwork, and partly to the seasonal difference between November and December. However, it is also likely that Kangaroo Grass (*Themeda triandra*) has proliferated over the years, so that even an extremely dry season would not now produce such a sparse ground cover as in Photo 1a. Carr & Peake described Beckett Park's enclosures in 1994 as having 'rank growth of exotic species and indigenous grasses such as Kangaroo Grass since the mowing was discontinued', but this is not evident in Photo 1a.



Site 53, Photo 1a. Quadrat 10 and its surroundings, as photographed by G. Carr on 24/11/94 from at or near Photo Point 1 (see aerial photo, p. 405). Reproduced from Carr and Peake (1995).



Site 53, Photo 1b. As close a match to the scene in Photo 1 as was possible on 24/12/04. The centre of Quadrat 10 is midway between the trunks of the two closest trees. The camera is 9 m north of the eastern enclosure's gate.

The other marked change between the two photographs is the increase in shrubs and trees, so that the horizon was no longer visible in 2004 and a mature Black Wattle (*Acacia mearnsii*) had come to occupy one-tenth of the quadrat (at the right-hand edge of Photo 1b).

The data from Quadrat 10 on 24/11/94 is stored in the Flora Information System database with catalogue number E23978. The corresponding data from 24/12/04 is stored with catalogue number N04086. The table below includes both sets of data. The entries in the columns headed 1994 and 2004 are Braun-Blanquet categories of vegetation cover: '+' = minor occurrence; '1' = <5% cover; '2' = 5-25% cover; '3' = 25-50% cover; '4' = 50-75% cover; '5' = >75% cover.

MGA coordinates 332110 m east, 5813503 m north. Quadrat area 707 m² (a circle of diameter 30 m).

Species Name	1994	2004	Species Name	1994	2004	Species Name	1994	2004
Wild indigenous species			<i>Microtis unifolia</i>	+		Weed species		
<i>Acacia mearnsii</i>	1	2	<i>Oxalis exilis/perennans</i>	1	+	<i>Acacia longifolia longifolia</i>		+
<i>Acaena agnipila</i>	+		<i>Pimelea curviflora</i>	1	1	<i>Agrostis capillaris</i>	2	1
<i>Atriplex semibaccata</i>		+	<i>Pimelea humilis</i>	1	+	<i>Aira caryophyllea</i>		1
<i>Austrodanthonia geniculata</i>	1		<i>Schoenus apogon</i>	1		<i>Anthoxanthum odoratum</i>	3	2
<i>Austrodanthonia laevis</i>		+	<i>Solenogyne dominii</i>	1		<i>Briza minor</i>	1	1
<i>Austrodanthonia racemosa</i>		1	<i>Thelymitra peniculata</i>	1	1	<i>Bromus catharticus</i>	2	
<i>Carex breviculmis</i>	+	+	<i>Themeda triandra</i>	3	5	<i>Bromus hordeaceus</i>	1	+
<i>Dichelachne crinita</i>		+	<i>Tricoryne elatior</i>	1	1	<i>Centaurium erythraea</i>	1	1
<i>Eucalyptus ?melliodora</i>		+	Planted species			<i>Centaurium tenuiflorum</i>	1	+
<i>Eucalyptus sp.</i>		+	<i>Acmena smithii</i>	1	2	<i>Cerastium glomeratum</i>	+	
<i>Gonocarpus tetragynus</i>	1	1	<i>Bulbine bulbosa</i>		+	<i>Cynodon dactylon</i>	1	1
<i>Hypnum ?cupressiforme</i>		3	<i>Chrysocephalum apiculatum</i>		+	<i>Dactylis glomerata</i>	1	1
<i>Kennedia prostrata</i>	1		<i>Chrysoceph. semipapposum</i>		+	<i>Ehrharta erecta</i>	1	1
<i>Leptorhynchos squamatus*</i>	1	+	<i>Goodenia ovata</i>		+	<i>Gamochaeta purpurea</i>	1	+
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>		1	<i>Lomandra longifolia</i>		1	<i>Hypochoeris radicata</i>	1	1
<i>Lomandra glauca</i>	+		<i>Ozothamnus ferrugineus</i>		+	<i>Lepidium africanum</i>		+
<i>Microlaena stipoides</i>		1	<i>Stylidium armeria</i>		+	<i>Paspalum dilatatum</i>		+
<i>Microtis parviflora</i>		1	<i>Xerochrysum viscosum</i>		+	<i>Plantago coronopus</i>	1	
						<i>Plantago lanceolata</i>	2	1

Species Name	1994	2004	Species Name	1994	2004	Species Name	1994	2004
<i>Romulea rosea</i>	2	1	<i>Sporobolus africanus</i>	2	1	<i>Trifolium repens</i>	1	
<i>Sonchus oleraceus</i>	1	+	<i>Trifolium dubium</i>	1		<i>Vulpia bromoides</i>	1	1

* At least some, and perhaps all, of the *Leptorhynchos squamatus* in 2004 were planted.

Some of the differences between the 1994 data and the 2004 data are probably artifices of differing species identification: the 1994 entry for *Microtis unifolia* almost certainly corresponds to the 2004 entry for *Microtis parviflora*, and the 1994 entry for *Lomandra glauca* almost certainly corresponds to the 2004 entry for *Lomandra filiformis* subsp. *coriacea*. The absence of the moss *Hypnum ?cupressiforme* from the 1994 data means nothing because Carr did not attempt to record mosses. Differences of one category in the Braun-Blanquet scale often occur solely due to variation between observers; e.g. the *Acmena smithii*'s cover is 6% (calculated from the aerial photograph), which could reasonably be recorded as either 1 or 2 on the Braun-Blanquet scale, based on field observations.

The meaningful comparisons between the 1994 and 2004 data from Quadrat 10 are:

- The cover of *Themeda triandra* changed from less than 50% to over 75%;
- The cover of weeds appears to have reduced, and by 2004, only one weed species had more than 5% coverage;
- The richness of wild indigenous plants and weeds have each remained unchanged, within the precision of the data;
- *Kennedia prostrata* has died out, and it should not be expected to re-appear without fire or a similar event;
- Woody plants are steadily increasing their cover within the quadrat.

These results indicate that the ecological wellbeing of Quadrat 10 improved slightly. However, the richness of wild indigenous plant species is still low. This is attributable to the absence of fire.

Other flora data

The table in the section headed 'Full flora list' on page 409 provides a useful indication of changes in the indigenous plant species present in the reserve. Combined with information from quadrat data:

- The following species have disappeared from the park and may require fire to bring about their regeneration: *Chamaescilla corymbosa*, *Kennedia prostrata*, *Plantago varia*, *Triptilodiscus pygmaeus* and *Vittadinia muelleri*.
- The native grasses *Austroanthonia geniculata* and *Eragrostis brownii* were fairly abundant until at least 1994, but they have strangely disappeared. These species are rather hardy (often growing in lawns) and do not rely on fire for their persistence. They may have been out-competed by *Themeda triandra*;
- Many weed species recorded in the 1980s or 1994 were either absent or negligible in 2004. Some of these are fairly inconsequential species that come and go from year to year, but others have gone due to management of the park. In particular, Fennel and several species of woody weeds (some of them quite serious) have been eradicated due to specific targeting. However, there are some indications that two of the most serious weeds, Sweet Vernal-grass (*Anthoxanthum odoratum*) and Panic Veldt-grass, have proliferated.

Bird censuses

Carr and Peake (1995) conducted four bird censuses on 28/11/94, deviating from the standard census method by limiting each one to only ten minutes duration (instead of the standard twenty minutes) and conducting them separately for the northern or southern halves of Beckett Park (which are much smaller areas than usual for a standard census). Despite these deviations from the standard method, the data can be made broadly compatible with the standard census taken for the present study by David Lockwood on 3/10/04. To achieve partial compatibility, bird counts for the first ten-minute census in 1994 for the southern half of Beckett Park are added to the bird counts for the first ten-minute census for the northern half of Beckett Park. The same sort of addition is done separately for the second ten-minute census in the southern and northern halves of the park. Such summations are biased because a single bird was sometimes recorded in 1994 for both the the southern and northern halves of the park, leading to double-counting. The results are presented alongside those from 2004 in the table below. Asterisks indicate introduced species.

	1994, census 1	1994, census 2	2004
Red Wattlebird	27	29	11
Brush Wattlebird			1
Eastern Rosella	6	8	
Rainbow Lorikeet			3
Brown Thornbill			2
Welcome Swallow		1	1
Magpie-lark		1	
Australian Magpie	3		1

*Common Blackbird	5	5	1
*Common Myna	1		
*Rock Dove			3
*Spotted Turtle-dove			1
Total number of birds	42	44	24
Number of native species	3	4	6
Number of introduced species	2	1	3

The data suggest that:

- The total number of birds was much higher in 1994 than 2004, even allowing for the upward bias introduced by aggregating the data of Carr and Peake;
- The number of native species was nevertheless higher in 2004 than 1994;
- The number of introduced species was not significantly different between the two years.

However, there appears to be no way of ruling out the possibility that these differences can be explained by the combined effects of normal bird count fluctuations that occur from hour to hour, day to day, month to month and year to year, independently of any underlying trends. Recent work by Marron *et al.* (2005) indicates that inter-annual variability can be large even in the absence of any local habitat change.

Future monitoring

For monitoring purposes, it is recommended to update the following information at the intervals indicated:

- The flora lists for the three parts of the site, as provided beneath the heading 'Full flora list' on page 409. Recommended interval four years. Check for loss or decline of indigenous species and shifts in abundances of weeds;
- Ratings of weed severity within each part of the site, stored in the database of this study. (Ratings for the park as a whole are given in the section headed 'Threats' above.) Recommended interval four years, synchronised with the previous task;
- Population sizes of scarce, significant plant species. The locations and population sizes are given in the section headed 'Flora of special significance' on page 407. Recommended interval four years, synchronised with the previous two tasks. Check the populations every two to four years, in conjunction with the previous two tasks;
- Habitat score of the site (excluding lawn and revegetation), as summarised on page 407. The author intends to keep the original field data sheets indefinitely so they will be available for future assessments. Recommended interval four years, in conjunction with the previous three tasks;
- Quadrat 10 and the associated photographs from Photo Point 1. Recommended interval four years, in conjunction with the previous four tasks, as well as one and two years following the burning of Quadrat 10 (which is recommended – see Priority action 1);
- The fauna list and twenty-minute bird census data. Repeat in October at intervals of approximately four years. Check for changes in abundance of birds, the particular species present and the species that are breeding.

Information sources used in this assessment

- A brief inspection of the park by the author with staff of the City of Boroondara on 6/9/04, which included recording observations, numbers and locations of *Hypoxis vaginata* and *Wurmbea dioica* while they were in flower;
- A vegetation and habitat survey, in conjunction with Maranoa Gardens, by Dr Lorimer and Matthew Dell for a total of 25 person-hours on 1/10/04, 21/10/04, 24/12/04 and 2/11/05, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species in each of five parts of the site, including the species' abundances and the threat level of all weed species in each area;
 - Assessment and documentation of quadrat N04087 for comparison against quadrat E23978 of 1994;
 - Determination of the habitat score of the natural vegetation;
 - Assessment, documentation and (where appropriate) mapping of populations of plant species that are rare in the site or more generally;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- A daytime bird survey of the site by David Lockwood on 3/10/04 according to the protocol discussed in Section 2.4.1, including a twenty-minute bird census;
- Reports:

- Carr G.W., Todd J.A., McMahon A.R.G and Bedggood S.E. (1989). Untitled botanical report about Beckett Park and Maranoa Gardens, prepared on behalf of Ecological Horticulture Pty Ltd for the City of Camberwell. c. 60 pp. + 2 maps;
- Carr G.W. and Peake P. (1995). *Indigenous Vegetation and Fauna of Maranoa Gardens and Beckett Park, City of Boroondara, Victoria*. Prepared on behalf of Ecology Australia Pty Ltd for the City of Boroondara. 58 pp. + 1 map. Note that there are internal inconsistencies and clear errors in the species of flora and fauna recorded in various parts of the report;
- *Maranoa Gardens and Beckett Park Masterplan – Part 1: The Masterplan*. Prepared in 1996 by a working group of the City of Boroondara. vii + 35 pp. + 4 maps;
- Discussions about the history and flora of the park with the full-time gardener at Maranoa Gardens, Andrea Dennis;
- A list of fauna for Beckett Park and Maranoa Gardens compiled by Andrea Dennis and other gardeners. This list was vetted carefully to select only records of high reliability;
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Acknowledgment

Thanks to Andrea Dennis and Paul Birch (gardeners at Maranoa Gardens) for documentation and verbal information about the park's history, management and flora.

Site 54. Maranoa Gardens, Balwyn

Public gardens showcasing Australian native plants, with small pockets of natural vegetation. Melway ref. 46 F7

Significance Level: *Local* (taking into account only the natural indigenous flora and fauna)

Summary of the most significant natural assets:

- Vestiges of the Ecological Vegetation Classes known as Grassy Woodland and Plains Grassy Woodland, both of which are endangered in the bioregion;
- Important populations of the locally threatened plant species, *Exocarpos cupressiformis* and *Isolepis marginata*;
- A structurally complex, rich assemblage of indigenous and Australian native plants that serves as an oasis and ecological stepping-stone for native birds in the local area.

Aerial photograph

The aerial photograph for this site is combined with the adjacent Beckett Park (Site 53), and appears on page 405.

Boundaries

The site is outlined in red on the aerial photograph. The boundary mostly follows fences and the edge of a footpath.

Land use & tenure: Council public garden.

Physical features

Site area: 3.0 hectares

Elevation: 102 m to 113 m

Landform: Upper slope of a hill with low relief.

Slope: 1:25 to 1:10, facing generally north in the northern half of the gardens and west in the southern half.

Soil type: Most of the gardens has topsoil comprising grey-brown coarse sand in a clay matrix, but the southwestern corner has grey-brown loam. Based on soil maps, the subsoil is yellow-brown to grey-brown mottled clay, but a new excavation opposite the gardens at 25 Kireep Rd has exposed dark orange clay subsoil.

Underlying geology: Most of the gardens is on a cap of poorly-consolidated Tertiary sand of the Red Bluff group. According to the Geological Survey of Victoria map, the cap does not extend into the gardens' southwestern corner, giving way to the underlying Silurian sedimentary rock of the Andersons Creek formation.

Site description

Maranoa Gardens is Melbourne's premier Australian plant garden. Mr J.M. Watson started planting Australian plants in 1901, until Council acquired the garden in the early 1920s and made it a public garden, gradually removing non-Australian species. The gardens have grown to contain a very diverse collection of species, spanning a broad range of life forms, sizes, ages, flower types and flowering seasons. Nectar-eating native birds benefit from the diversity of plants and flowering seasons, which provide food year-round; however, this has caused an imbalance among the different types of birds, resulting in (or exacerbating) insect pest problems. Possums may also be in unnaturally large numbers, which could be harming the health of trees through over-browsing.

As the gardens have grown, some of the original eucalypts and two patches of indigenous ground flora have been retained. The remaining eucalypts are marked on the aerial photograph on page 405. The main patch of indigenous ground flora constitutes the area marked as 'Quadrat 8' on the aerial photograph. It retains a modest diversity of indigenous species along with about a dozen specimen plantings from other parts of Australia. The other patch of ground flora is in the southwest of the gardens, eastwards from the toilet block, where there are a handful of indigenous ground flora species growing beneath planted non-indigenous trees.

Because of the significance of Maranoa Gardens, there have been two prior botanical studies conducted: Carr *et al.* (1989) and Carr & Peake (1995). The gardens' remnant indigenous vegetation was also taken into account in the *Maranoa Gardens and Beckett Park Masterplan* of 1996. Full bibliographic details of these reports appear on p. 426.

Ecological links with other land

Maranoa Gardens adjoins Beckett Park (Site 53). Any native fauna species present in one of these two sites is likely to be present in the other site, at least occasionally. The pollen of most indigenous plant species would also be exchanged between the sites, thereby reducing inbreeding.

Taken as a pair, these sites are rather ecologically isolated from other areas of native vegetation. Most of the fauna recorded are typical of residential areas in Melbourne's eastern suburbs. However, the presence of certain bird species, such as robins and Gang-gang Cockatoos, suggests that the pair of sites plays a (probably minor) role as an ecological stepping-stone for such nomadic species.

Habitat type

The native vegetation of Maranoa Gardens is so heavily modified from a natural state that it has lost whatever species once distinguished whether the vegetation belonged to Grassy Woodland (EVC 175) or Plains Grassy Woodland (EVC 55). Probably both of these EVCs were once represented, the latter in the southwest and the former elsewhere. Both of these EVCs are **endangered** in the Gippsland Plain bioregion.

The structure and composition of the native components of the vegetation are summarised as follows:

Canopy trees: Dominated by *Eucalyptus camaldulensis* to 20 m tall, with a single *Eucalyptus melliodora*.

Lower trees: Dominated by *Acacia mearnsii* with a few *Acacia implexa* and a single *Exocarpos cupressiformis*.

Shrubs: *Acacia pycnantha* was recorded in 1989 and 1994, but had disappeared by 2004.

Vines and ferns: There are no records of any indigenous vines or ferns.

Ground flora: Dominated by *Microlaena stipoides*, also with a substantial cover of several species of *Austrodanthonia* (particularly *Austrodanthonia bipartita/fulva*). *Austrostipa mollis*, *Arthropodium strictum* and *Lomandra filiformis coriacea* are also locally abundant. The ecological indicator species, *Leptorhynchos squamatus* and *Tricoryne elatior*, have been recorded, but the former disappeared since 1994.

Flora of special significance

The significant plant species below have been recorded in Maranoa Gardens. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Last Record	Notes
Extinct	<i>Pterostylis nutans</i>	1989	One small colony in Quadrat 8 had died out by 1994.
Critically Endangered	<i>Exocarpos cupressiformis</i>	2004	One suckering individual, mapped on page 405.
Endangered	<i>Leptorhynchos squamatus</i>	1989	Recorded as scarce in 1989, in Quadrat 8.
Endangered	<i>Lomandra filiformis filiformis</i>	2004	Scarce, in Quadrat 8.
Endangered	<i>Senecio minimus</i>	1989	Recorded as scarce in 1989, in Quadrat 8.
Endangered	<i>Solanum laciniatum</i>	2004	Apparently naturalised from planted specimens.
Vulnerable	<i>Austrodanthonia geniculata</i>	2005	About one dozen plants found, mainly in the southwest.
Vulnerable	<i>Austrodanthonia laevis</i>	1994	Recorded as fairly abundant in 1994, in Quadrat 8.
Vulnerable	<i>Austrostipa ?semibarbata</i>	1989	Recorded as fairly abundant in 1989, in Quadrat 8.
Vulnerable	<i>Carex breviculmis</i>	1989	Recorded as fairly abundant in 1989, in Quadrat 8.
Vulnerable	<i>Isolepis marginata</i>	2004	A small colony just SW of Quadrat 8 – see aerial photo.
Vulnerable	<i>Poa morrisii</i>	1989	Recorded as fairly abundant in 1989, in Quadrat 8.
Vulnerable	<i>Acacia pycnantha</i>	1994	Recorded in Quadrat 8.
Vulnerable	<i>Eucalyptus melliodora</i>	2005	Two mature trees and at least one sapling.
Data Deficient	<i>Dianella longifolia</i> s.l.	1994	The precise identity and status of this record is unclear.

1994 records of *Lomandra micrantha* and *Orthoceras strictum* are regarded here as unreliable and therefore omitted from the list above.

Full flora list

The table below lists the indigenous plant species recorded in Maranoa Gardens, and non-indigenous species growing within native vegetation in the gardens. The column headed '1' is for the patch of native vegetation in the northwestern corner ('Quadrat 8') and the column headed '2' is for the rest of the gardens' native vegetation (mostly in the southwest).

In the grid squares:

D = the species is dominant in its vegetation stratum;

M = many plants were found in 2004-5;

X = Not found in 2004-5, but recorded previously;

✓ = moderate numbers were recorded in 2004-5; and

– = very few plants were recorded in 2004-5.

Species Name	Area		Species Name	Area		Species Name	Area	
	1	2		1	2		1	2
Wild indigenous species			Naturalised indigenous species			Weed species		
<i>Acacia implexa</i>	✓		<i>Clematis microphylla</i>	✓		<i>Acacia elata</i>	-	✓
<i>Acacia mearnsii</i>	D		<i>Solanum laciniatum</i>	-	✓	<i>Agapanthus praecox</i>	-	
<i>Acacia pycnantha</i>	X		Planted species			<i>Agrostis capillaris</i>	✓	
<i>Arthropodium strictum</i>	M	✓	<i>Acacia elata</i>			<i>Asparagus scandens</i>		✓
<i>Austrodanthonia bipartita/fulva</i>	M		<i>Acacia ?prominens</i>	-	-	<i>Allium triquetrum</i>	✓	
<i>Austrodanthonia geniculata</i>	-	✓	<i>Acacia implexa</i>			<i>Anthoxanthum odoratum</i>	✓	✓
<i>Austrodanthonia laevis</i>	X		<i>Acacia leprosa</i>			<i>Bromus catharticus</i>		X
<i>Austrodanthonia racemosa</i>	✓	M	<i>Acacia mearnsii</i>			<i>Chlorophytum comosum</i>		X
<i>Austrodanthonia setacea</i>	X		<i>Acacia pycnantha</i>			<i>Conyza sumatrensis</i>	X	
<i>Austrostipa mollis</i>	M		<i>Acmena smithii</i>			<i>Coprosma repens</i>	X	
<i>Austrostipa ?semibarbata</i>	X		<i>Agathis sp.</i>			<i>Cotoneaster glaucophyllus</i>	-	
<i>Bursaria spinosa</i>	-		<i>Allocasuarina verticillata</i>	-		<i>Cotoneaster pannosus</i>	X	X
<i>Carex breviculmis</i>	X		<i>Callitris sp.</i>	-		<i>Crataegus monogyna</i>		X
<i>Cotula australis</i>	-		<i>Clematis aristata</i>			<i>Dactylis glomerata</i>	✓	X
<i>Dianella longifolia s.l.</i>	X		<i>Corymbia citriodora</i>			<i>Dietes iridioides</i>	✓	
<i>Dichelachne crinita</i>		X	<i>Corymbia ficifolia</i>	-		<i>Ehrharta erecta</i>	✓	D
<i>Dichondra repens</i>	X	✓	<i>Dianella longifolia s.l.</i>			<i>Ehrharta longiflora</i>	✓	
<i>Elymus scaber</i>	-		<i>Dianella tasmanica</i>			<i>Hedera helix</i>	X	
<i>Eucalyptus camaldulensis</i>	D	✓	<i>Eucalyptus cinerea</i>	-		<i>Hypochoeris radicata</i>	✓	✓
<i>Eucalyptus melliodora</i>	-		<i>Eucalyptus alpina</i>	-		<i>Ixia maculata/polystachya</i>	X	
<i>Exocarpos cupressiformis</i>		-	<i>Eucalyptus sp.</i>	-		<i>Leontodon taraxacoides</i>	-	
<i>Isolepis marginata</i>	✓		<i>Eucalyptus viminalis</i>	X		<i>Oxalis incarnata</i>	✓	✓
<i>Leptorhynchos squamatus</i>	X		<i>Geijera parviflora</i>	-		<i>Oxalis pes-caprae</i>	X	✓
<i>Lomandra filiformis coriacea</i>	M		<i>Hakea salicifolia</i>	X		<i>Passiflora ?cinnabarina</i>	-	
<i>Lomandra filiformis filiformis</i>	-		<i>Lomatia myricoides</i>			<i>Pittosporum undulatum</i>	X	-
<i>Microlaena stipoides</i>	D	D	<i>Poa labillardierei</i>			<i>Poa pratensis</i>		X
<i>Muellerina eucalyptoides</i>		✓	<i>Poa morrisii</i>	-	✓	<i>Prunus cerasifera</i>		X
<i>Oxalis exilis/perennans</i>		✓	<i>Pterostylis curta</i>			<i>Romulea rosea</i>	✓	
<i>Poa morrisii</i>	X					<i>Solanum nigrum</i>	-	
<i>Pterostylis nutans</i>	X					<i>Sonchus oleraceus</i>	-	-
<i>Senecio minimus</i>	X					<i>Sporobolus africanus</i>	✓	✓
<i>Senecio quadridentatus</i>	X					<i>Stellaria media</i>		X
<i>Themeda triandra</i>	-					<i>Taraxacum sp.</i>	X	X
<i>Tricoryne elatior</i>	✓					<i>Viola odorata</i>	X	
						<i>Vulpia sp.</i>		✓
						<i>Westringia fruticosa</i>		✓

Large old trees

Three remnant River Red Gums (*Eucalyptus camaldulensis*) at Maranoa Gardens have trunk diameters exceeding 0.8 m, thereby qualifying as large old trees according to the Department of Sustainability & Environment’s criterion for woodland dominated by Red Gums. These trees are each circled in yellow and numbered on the aerial photograph on page 405. Their characteristics are tabulated below.

Tree number:	1	2	3
Trunk diameter:	98 cm	102 cm	88 cm (the larger of two trunks)
Health:	Fair to good	Poor	Poor

The three other remnant River Red Gums in the gardens are also suffering from dieback. The type of damage suggests possums and insect attack, although trees that have been protected from possums by plastic collars around their trunks have not recovered. Tree 3 (near the Parring Rd entrance) has some Creeping Mistletoe (*Muellerina eucalyptoides*) that represents an unacceptable burden on a significant tree that is already under great stress. Some other large old River Red Gums have been removed in recent years due to dieback and the risk of falling. The mature Yellow Box is in good health.

Photos 1 to 4 below, taken on 1st October 2004, are to facilitate future monitoring of the extent of dieback. Photo 4 shows a remnant River Red Gum (not a large old tree) close to death. It has various scars around its bole.



Site 54, Tree 1, looking upward from 2 m south of the base of the trunk (Photo Point 3 on the aerial photograph on page 405).



Site 54, Tree 2, looking upward from 2 m south of the base of the trunk (Photo Point 5 on the aerial photograph on page 405).



Site 54, Tree 3, viewed from Photo Point 6 on the aerial photograph on page 405.



Site 54. Looking upward into the crown of a near-dead medium-sized River Red Gum at Photo Point 4 on the aerial photograph on page 405. The camera was 2 m south of the base of the trunk.

Fauna lists

Fauna found in Maranoa Gardens are likely to be also present in the adjoining Beckett Park (Site 53), at least occasionally. Therefore, lists of fauna for these two sites has been combined, and can be viewed at page 410.

Bird census results

One twenty-minute bird census was carried out in Maranoa Gardens as part of the bird survey by David Lockwood on 12/11/04. He recorded ten native species and two introduced species. The species with the highest counts were Red Wattlebird (17), Australian Magpie (5), Common Blackbird (3) and two each of Brown Thornbill, White-browed Scrubwren, Rainbow Lorikeet, Welcome Swallow and Spotted Turtle-dove. The number of species is moderately high by

Boroondara's standards are richer than the census conducted in the adjoining Beckett Park, supporting the expectation that the gardens provide habitat for a broader range of birds than Beckett Park or most of Boroondara.

Fauna habitat

The multiple strata of vegetation and the areas of dense shrubs provide suitable habitat for a range of forest birds. Red Wattlebirds are in large numbers due to the more open areas and the presence of Australian native trees and shrubs that collectively produce abundant nectar nearly all year.

Site significance ratings

The following is an assessment of Maranoa Gardens' biological significance against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004). This only takes into account the indigenous flora and fauna. The non-indigenous plantings are important for reasons outside the scope of this report and the BioSites criteria.

Ecological integrity and viability

Maranoa Gardens has a structurally complex, rich assemblage of indigenous and Australian native plants that serves as an oasis and ecological stepping-stone for native birds in the local area, as evidenced by consistent (albeit brief) observations of bird species that are locally uncommon (e.g. robins, Crested Shrike-tit, Gang-gang Cockatoo, Southern Boobook). BioSites criterion 1.2.6 associates **Local** significance to such a site that serves as a local scale stepping-stone and represents a 'Link between individual remnant habitat blocks or within subcatchment'.

Regionally threatened Ecological Vegetation Class

According to the criteria of 'Victoria's Native Vegetation Management – A Framework for Action' (NRE 2002a), substantially degraded native vegetation belonging to an endangered EVC such as Grassy Woodland or Plains Grassy Woodland (as at Maranoa Gardens) has a conservation significance rating of High. This would translate to State significance under BioSites criterion 3.2.3 except that the area of native vegetation does not reach the minimum of 0.25 ha to qualify.

Rare or threatened plants

The population of the locally vulnerable *Isolepis marginata* at the southwestern corner of Quadrat 8 is small but nevertheless the largest known remaining population in Boroondara. It probably has a viable future. It therefore qualifies for **Local** significance under BioSites criterion 3.1.5.

Exocarpos cupressiformis is such a rare species in Boroondara that the one in Maranoa Gardens (like the nearby one in Beckett Park) could be regarded as an 'important site or population of the taxon in the local area' in the sense of BioSites criterion 3.1.5, and thereby represents **Local** significance.

The other locally threatened plant species listed under the heading 'Flora of special significance' have either disappeared in recent years or have populations so small as to bring their continuing survival into question. They therefore do not currently qualify as significant under BioSites criterion 3.1.5.

Large old trees

The BioSites criteria do not recognise any biological significance of eucalypts solely on the basis of size. The remnant trees in Maranoa Gardens are therefore not significant under the BioSites criteria, but this should not be taken to imply that they are not significant when considered against criteria related to heritage or aesthetics.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as three of the River Red Gums at Maranoa Gardens. However, the latest version of the criteria states, 'Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats'. The last sentence is not correct in the context of Maranoa Gardens, or Boroondara more generally.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Eucalypt dieback disease due to insects, possums or other causes.	Trees; Grassy Woodland; Plains Grassy Woodland	High	Current

Threat	Natural assets affected	Severity	When?
Displacement of small native birds by the aggressive Red Wattlebird, exacerbating eucalypt dieback.	Birdlife; Trees; Grassy Woodland; Plains Grassy Woodland	Moderate	Current
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious (only in the southwest): Panic Veldt-grass (<i>Ehrharta erecta</i>), Pale Wood-sorrel (<i>Oxalis incarnata</i>); • Moderately serious: Cedar Wattle (<i>Acacia elata</i>), Agapanthus (<i>Agapanthus praecox</i> subsp. <i>orientalis</i>), Brown-top Bent (<i>Agrostis capillaris</i>), Angled Onion (<i>Allium triquetrum</i>), Sweet Vernal-grass (<i>Anthoxanthum odoratum</i>), Asparagus Fern (<i>Asparagus scandens</i>), Cotoneaster (<i>Cotoneaster glaucophyllus</i>), Cocksfoot (<i>Dactylis glomerata</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Annual Veldt-grass (<i>Ehrharta longiflora</i>), Cat's Ear (<i>Hypochoeris radicata</i>), Dietes (<i>Dietes ?iridioides</i>), Variable Ixia (<i>Ixia polystachya</i>), Pale Wood-sorrel (<i>Oxalis incarnata</i>), Sour-sob (<i>Oxalis pes-caprae</i>), Passion-flower (<i>Passiflora ?cinnabarina</i>), Sweet Pittosporum (<i>Pittosporum undulatum</i>), Common Onion-grass (<i>Romulea rosea</i>), Indian Rat-tail Grass (<i>Sporobolus africanus</i>), Rat's-tail Fescue (<i>Vulpia</i> sp.), Coast Rosemary (<i>Westringia fruticosa</i>). 	Ground flora of Grassy Woodland and Plains Grassy Woodland	Moderate	Current

Priority actions

1. Increase the attention paid to eucalypt dieback in the remnant River Red Gums, particularly the significant tree at Photo Point 4 on the aerial photograph on page 405. Ensure these trees receive adequate irrigation. Remove mistletoe from Tree 3. Check soil compaction and aerate if required. Seek expert arboricultural advice on dieback causes and solutions. The importance and urgency of this action are high, from the perspective of the whole municipality.
2. Conduct a total of at least twenty person-hours per year of hand weeding of non-indigenous plants in the patches of remnant vegetation in the northwest and southwest of the gardens, concentrated in September to December. The weeding requires confident recognition of indigenous and introduced grasses, including Panic Veldt-grass plants that are too young to flower.

Past management and revegetation

Species indigenous to the local area and the Melbourne region generally have been incorporated into the gardens' plantings. A bed of locally indigenous species has been planted recently along Yarrbat Avenue. There have also been 'enrichment plantings' of locally indigenous species (e.g. one *Poa morrisii* and one clump of *Pterostylis curta*) within the patch of remnant vegetation in the northwest corner of the gardens.

Future revegetation

The existing program of enrichment plantings should continue, with the objective of establishing populations of sufficient size to allow reproduction without serious inbreeding problems. Inbreeding may be countered by establishing a program of exchange of propagating material with other sites where the same species grow, including Beckett Park. Maranoa Gardens is an ideal place to coordinate such an exchange program.

Apart from indigenous species listed in this report for Maranoa Gardens and Beckett Park, Appendix C provides a selection of species suitable for Grassy Woodland (in the northwest of the gardens) and Plains Grassy Woodland (in the southwest).

Records should be kept of any planting done in this (or any other) site, including species, numbers and locations.

Monitoring of past change

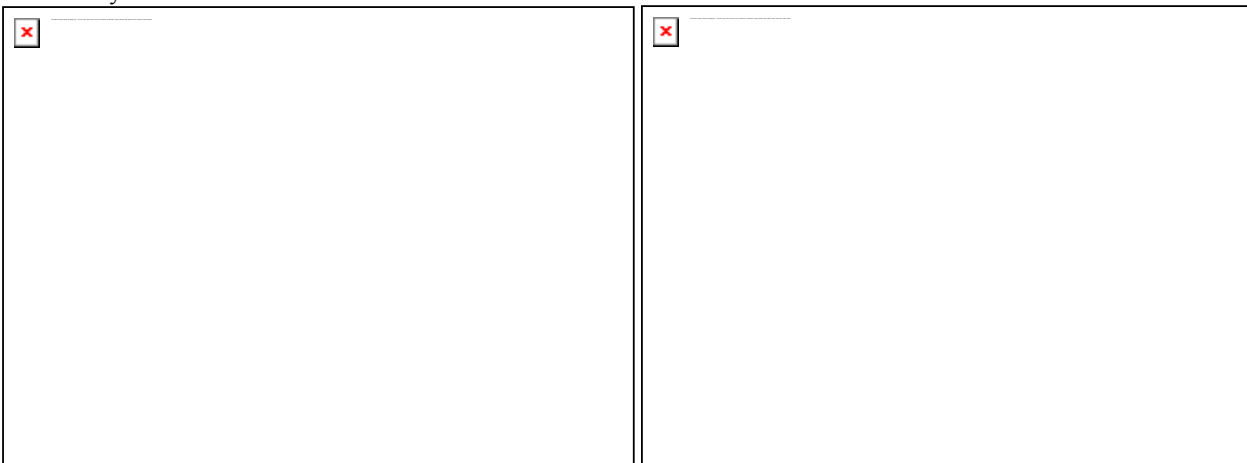
Quadrats

Carr *et al.* (1989) surveyed a quadrat in Maranoa Gardens and labelled it 'Quadrat 8'. Carr resurveyed the quadrat in 1994 for the report by Carr and Peake (1995), and surveyed an additional quadrat that he labelled 'Quadrat 9'. The locations of the quadrats were marked on a map in the latter report, but only very roughly.

Both quadrats would be expected to be useful for monitoring purposes. However, the data for Quadrat 9 appear to be flawed; e.g. there is an implausible entry for the rare orchid of swampy ground, *Orthoceras strictum*, and several clearly non-indigenous species are listed as indigenous (*Acacia leprosa*, *Dianella* cf. *tasmanica* and *Pittosporum undulatum*). Attempts to obtain corrections or original field data have been unsuccessful. Therefore, only Quadrat 8 has been resurveyed for the present study.

Because the location and size of the original Quadrat 8 are uncertain, the author took the quadrat to cover the whole contiguous area that had at least 10% cover of indigenous ground flora. The area selected is mapped to an accuracy of ± 3 m on the aerial photograph on page 405 and covers approximately 700 m².

The two photographs below show Quadrat 8 on 24/11/94 and 1/10/04 (the former reproduced from the cover of Carr & Peake 1995). The change in the ground flora density between the two photographs' foregrounds is attributable to the 'extremely dry season' that Carr & Peake describe for the 1994 fieldwork. In other respects, the two photographs are remarkably similar.



Site 54, Photo point 2, 24/11/94. The western half of Quadrat 8, as photographed by G. Carr. The trunk near the left edge belongs to the *Eucalyptus cinerea* at the centre of the quadrat. Reproduced from Carr and Peake (1995).

Site 54, Photo point 2, 1/10/04. The same scene as at left. The lush grass compared with the earlier photograph is attributable to more favourable growing conditions in the preceding months.

The data from Quadrat 8 on 12/9/89, 24/11/94 and 24/12/04 are tabulated side by side below. The three sets of data are stored in the Department of Sustainability & Environment's Flora Information System database with catalogue numbers E13358, E23979 and N04088, respectively. In the table below, the entries in the columns headed 1989, 1994 and 2004 are Braun-Blanquet categories of vegetation cover: '+' = minor occurrence; '1' = <5% cover; '2' = 5-25% cover; '3' = 25-50% cover; '4' = 50-75% cover; '5' = >75% cover.

MGA coordinates 331855 m east, 5813590 m north. Quadrat area c. 700m² (irregular shape as mapped).

Species Name	1989	1994	2004	Species Name	1989	1994	2004	Species Name	1989	1994	2004
Wild indigenous species				<i>Dichondra repens</i>	+	1		Naturalised indigenous species			
<i>Acacia implexa</i>		1	+	<i>Elymus scaber</i>	1	1	+	<i>Clematis microphylla</i>			+
<i>Acacia mearnsii</i>	1	1	1	<i>Eucalyptus camaldulensis</i>	1	2	2	<i>Solanum laciniatum</i>			+
<i>Acacia pycnantha</i>	1	1		<i>Eucalyptus melliodora</i>			+	Planted species			
<i>Arthropodium strictum</i>	1		1	<i>Leptorhynchos squamatus</i>	+			<i>Acacia ?prominens</i>		2	+
<i>Austrodanthonia bipartita/fulva</i>	1	1	1	<i>Lomandra filiformis</i> subsp. <i>coriacea</i>		1	1	<i>Agathis</i> sp. (1 plant)	1	1	1
<i>Austrodanthonia geniculata</i>	1	1	+	<i>L. filiformis</i> subsp. <i>filiformis</i>	1		+	<i>Allocasuarina verticillata</i>		1	+
<i>Austrodanthonia laevis</i>		1		<i>Microlaena stipoides</i>	3	3	4 ½	<i>Angophora costata</i>			1
<i>Austrodanthonia racemosa</i>	1	1	1	<i>Poa morrisii</i>	1			<i>Callitris</i> sp.	1	1	1
<i>Austrodanthonia setacea</i>		1		<i>Pterostylis nutans</i>	+			<i>Corymbia ficifolia</i>	2		2
<i>Austrostipa mollis</i>	1	1	1	<i>Senecio minimus</i>	+			<i>Eucalyptus cinerea</i> s.l.	3	3	2
<i>Austrostipa ?semibarbata</i>	1			<i>Senecio quadridentatus</i>	+			<i>Eucalyptus alpina</i>	1	1	
<i>Bursaria spinosa</i>			+	<i>Themeda triandra</i>		1	+	<i>Eucalyptus</i> sp.	+	1	+
<i>Carex breviculmis</i>	1			<i>Tricoryne elatior</i>		1	1	<i>Eucalyptus viminalis</i>	1	1	
<i>Cotula australis</i>			+					<i>Geijera parviflora</i>	1	1	1
<i>Dianella longifolia</i> s.l.	+	+									

Species Name	1989	1994	2004	Species Name	1989	1994	2004	Species Name	1989	1994	2004
<i>Hakea salicifolia</i>	2			<i>Cotoneaster glaucophyllus</i>			+	<i>Oxalis incarnata</i>	1	1	+
<i>Poa morrisii</i> (1 plant)			+	<i>Cotoneaster pannosus</i>	+			<i>Oxalis pes-caprae</i>	1		
Weed species				<i>Dactylis glomerata</i>	1	1	1	<i>Passiflora ?cinnabarina</i>			+
<i>Acacia elata</i>	1	2	+	<i>Dietes iridioides</i>		1	1	<i>Pittosporum undulatum</i>	+	1	
<i>Agapanthus praecox</i>		1	+	<i>Ehrharta erecta</i>	2	2	1	<i>Romulea rosea</i>			+
<i>Agrostis capillaris</i>	1	1	1	<i>Ehrharta longiflora</i>			+	<i>Solanum nigrum</i>			+
<i>Allium triquetrum</i>			+	<i>Hedera helix</i>		+		<i>Sonchus oleraceus</i>	1	+	+
<i>Anthoxanthum odoratum</i>			+	<i>Hypochoeris radicata</i>	+	1	+	<i>Sporobolus africanus</i>		+	+
<i>Conyza sumatrensis</i>	+			<i>Ixia maculata/ polystachya</i>	1		+	<i>Taraxacum</i> sp.		+	
<i>Coprosma repens</i>	+	+		<i>Leontodon taraxacoides</i>			+	<i>Viola odorata</i>	+	+	
				<i>Malus pumila</i>	+						

Differences of one Braun-Blanquet category are not significant, particularly allowing for the different boundaries that were used for the quadrat. The absence of *Corymbia ficifolia* from the 1994 data is bound to be an oversight. Comparisons that are significant from the three sets of data are:

- The cover of *Microlaena stipoides* changed from less than 50% to approximately 75% in 2004, possibly due to different weather conditions in the months leading up to the various surveys;
- Five indigenous species recorded in 1989 were not seen again, and six indigenous species seen in 1994 were not seen in 2004. Conversely, *Bursaria spinosa*, *Cotula australis* and *Eucalyptus melliodora* appeared in 2004 for the first time. There has been a net reduction in the number of indigenous plant species, but the magnitude of the reduction is possibly attributable to normal fluctuations that inevitably occur in woodlands;
- Apart from the removal of planted trees that posed an ecological threat (namely *Acacia elata*, *Acacia ?prominens* and *Pittosporum undulatum*), the non-indigenous flora changed very little over the fifteen-year span.

These results indicate that the overall ecological wellbeing of Quadrat 8 was either maintained or deteriorated slightly over the period 1989-2004. However, the quadrat data does not help to monitor the health of the remnant River Red Gums, which is now generally poor in Maranoa Gardens.

Other flora data

The table in the section headed 'Full flora list' on page 409, and the more detailed data used to compile that table, provide a useful indication of changes in the indigenous plant species present in the reserve:

- Fifteen indigenous plant species appear to have disappeared from the gardens, equal to 43% of all indigenous species recorded since 1989;
- Four indigenous plant species were recorded for the first time in 2004, namely *Bursaria spinosa*, *Exocarpos cupressiformis*, *Isolepis marginata* and *Muellerina eucalyptoides*. The *Exocarpos cupressiformis* and *Muellerina eucalyptoides* were almost certainly present in 1989 and 1994 but overlooked;
- There appears to have been a substantial net decline in the number of indigenous species growing in the gardens between 1989 and 2004.

Bird censuses

Carr and Peake (1995) conducted four bird censuses on 28/11/94, deviating from the standard census method by limiting each one to only ten minutes duration (instead of the standard twenty minutes) and conducting them separately for the northern and southern halves of Maranoa Gardens (which are much smaller than usual for a standard census). Despite these deviations from the standard method, the data can be made broadly compatible with the standard census taken for the present study by David Lockwood on 12/11/04. To achieve partial compatibility, bird counts for the first ten-minute census in 1994 for the southern half of Maranoa Gardens are added to the bird counts for the first ten-minute census for the northern half of the gardens. The same sort of addition is done separately for the second ten-minute census in the southern and northern halves of the gardens. Such summations are biased because a single bird was sometimes recorded in 1994 for both the southern and northern halves of the park, leading to double-counting. The results are presented alongside those from 2004 in the table on the next page. Asterisks indicate introduced species.

The data suggest that:

- The total number of birds was much higher in 1994 than 2004, even allowing for the upward bias introduced by aggregating the data of Carr and Peake;
- The number of native species was nevertheless higher in 2004 than 1994; and
- The number of introduced species was not significantly different between the two years.

	1994, 1 st census	1994, 2 nd census	2004
Red Wattlebird	25	29	17
Brush Wattlebird	12	12	7
White-plumed Honeyeater	2	1	
Eastern Rosella		1	
Rainbow Lorikeet	3		2
Spotted Pardalote			1
Brown Thornbill	8	8	2
White-browed Scrubwren			2
Silvereye		2	1
Welcome Swallow		1	2
Magpie-lark	1		
Australian Magpie			5
Pied Currawong			1
*Common Blackbird	26	23	3
*Spotted Turtle-dove	1	2	2
Total number of birds	78	79	45
Number of native species	6	7	10
Number of introduced species	2	1	2

However, there appears to be no way of ruling out the possibility that these differences can be explained by the combined effects of normal bird count fluctuations that occur from hour to hour, day to day, month to month and year to year, independently of any underlying trends. Recent work by Marron *et al.* (2005) indicates that inter-annual variability can be large even in the absence of any local habitat change.

Comparing the table of bird census results above with the equivalent table for Beckett Park (page 415), the richness and abundance of birdlife was much greater in Maranoa Gardens than the adjoining Beckett Park, in both 1994 and 2004. This supports the expectation that Maranoa Garden's structurally complex and botanically diverse vegetation would provide habitat for a richer bird fauna than Beckett Park.

Future monitoring

For monitoring purposes, it is recommended to update the following information at the intervals indicated:

- The plant lists beneath the heading 'Full flora list' on page 419. Recommended interval four years. Check for loss or decline of indigenous species and shifts in abundances of weeds;
- Quadrat 8 and the associated photographs. Recommended interval four years, in conjunction with the previous task;
- The fauna list and twenty-minute bird census data. Repeat in October at intervals of approximately four years. Check for changes in abundance of birds, the particular species present and the species that are breeding;
- The four photos of River Red Gums on page 421, to monitor the severity of dieback. Recommended interval one year, perhaps done by staff at the gardens.

Information sources used in this assessment

- A vegetation and habitat survey, in conjunction with Beckett Park, by Dr Lorimer and Matthew Dell for a total of 24 person-hours on 1/10/04, 21/10/04, 24/12/04 and 2/11/05, using this study's standard approach described in Section 2.3. This included:
 - Compilation of lists of indigenous and introduced plant species in each of five parts of the site, including the species' abundances and the threat level of all weed species in each area;
 - Assessment and documentation of quadrat N04088 for comparison against quadrats E13358 of 1989 and E23979 of 1994;
 - Assessment, documentation and (where appropriate) mapping of populations of plant species that are rare in the site or more generally;
 - Individual measurement and health assessment of large old trees;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- A daytime bird survey of the site by David Lockwood on 3/10/04 according to the protocol discussed in Section 2.4.1, including a twenty-minute bird census;
- Reports:

- Carr G.W., Todd J.A., McMahon A.R.G and Bedggood S.E. (1989). Untitled botanical report about Beckett Park and Maranoa Gardens, prepared on behalf of Ecological Horticulture Pty Ltd for the City of Camberwell. c. 60 pp. + 2 maps;
- Carr G.W. and Peake P. (1995). *Indigenous Vegetation and Fauna of Maranoa Gardens and Beckett Park, City of Boroondara, Victoria*. Prepared on behalf of Ecology Australia Pty Ltd for the City of Boroondara. 58 pp. + 1 map. Note that there are internal inconsistencies and clear errors in the species of flora and fauna recorded in various parts of the report;
- *'Maranoa Gardens and Beckett Park Masterplan – Part 1: The Masterplan*. Prepared in 1996 by a working group of the City of Boroondara. vii + 35 pp. + 4 maps;
- A brochure headed 'Welcome to the City of Boroondara's Maranoa Gardens', undated, available at the main entrance;
- Discussions about the history and flora of the gardens with the full-time gardener at Maranoa Gardens, Andrea Dennis;
- A list of fauna for Maranoa Gardens and Beckett Park compiled by Andrea Dennis and other gardeners. This list was vetted carefully to select only records of high reliability;
- Information from the Department of Sustainability & Environment's flora, fauna and BioSites databases;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Acknowledgment

Thanks to Andrea Dennis and Paul Birch (gardeners at Maranoa Gardens) for documentation and verbal information about the park's history, management and flora.

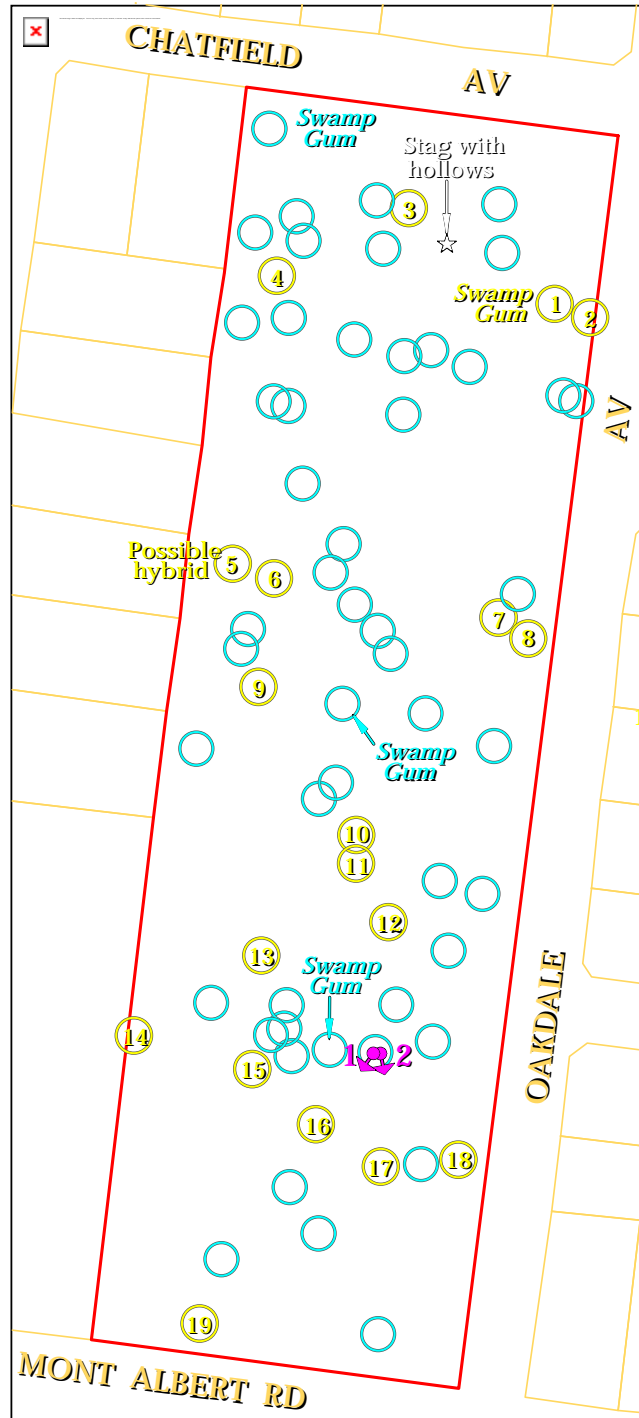
Site 55. Belmont Park, Canterbury

Council amenity park with many trees, most of which are remnants of the pre-European flora. Melway ref. 46 B8.

Significance Level: *Local*

Summary of the most significant natural assets:

- An abundance of the locally vulnerable Kneed Wallaby-grass (*Austrodanthonia geniculata*).
- Four of the locally endangered Swamp Gum (*Eucalyptus ovata*), one of which is a large old tree;
- Sixty-seven remnant River Red Gums (*Eucalyptus camaldulensis*), eighteen of which are large old trees.



Scale 1:1,600

0 10 20 30 40 50 m

LEGEND

- Numbered photo point
 - ① Numbered trees with trunk diam. >0.8 m
 - Remnant trees with trunk diam. <0.8 m
- Circled trees are River Red Gums except where otherwise labelled.*

Boundaries

This site is the whole of Belmont Park, whose single allotment is outlined in red on the aerial photograph on the previous page.

Land use & tenure

Council park for passive recreation.

Physical features

Site area: 2.4 hectares

Elevation: 71 m to 85 m

Landform: Upper and middle slope of a low ridge in gently undulating terrain.

Slope: Typical gradient 1:20, with a northerly to northeasterly aspect.

Soil type: Grey sand over brown to grey mottled clay (based on the Geological Survey of Victoria maps).

Underlying geology: Poorly consolidated Tertiary sands of the Red Bluff group, possibly eroded away in the northwest to expose the underlying siltstones of the Silurian Andersons Creek formation.

Site description

Belmont Park is dominated by large specimens of naturally occurring River Red Gums (*Eucalyptus camaldulensis*), some of them pre-dating European settlement. The other plants that occur naturally are four of the locally endangered Swamp Gum (*Eucalyptus ovata*), some Creeping Mistletoe (*Muellerina eucalyptoides*), some native grasses and a few Common Cotula (*Cotula australis*). Less than 1% of the park has more than 10% cover of native understorey, but there are several hundred square metres of ground dominated by the locally vulnerable Kneed Wallaby-grass (*Austrodanthonia geniculata*). The grass weeds, Indian Rat-tail Grass (*Sporobolus africanus*), Couch (*Cynodon dactylon*) and Kikuyu (*Pennisetum clandestinum*), dominate the rest of the park's ground flora, restricting the spread (but not the survival prospects) of the indigenous plants.

Along with the naturally occurring flora, there are recent plantings of indigenous species (eucalypts and understorey), and many mature planted trees, mostly of species from other parts of Australia.

The park's remnant eucalypts are its most important natural assets. Eighteen of the River Red Gums and one Swamp Gum qualify as large old trees according to the Department of Sustainability & Environment's criterion for woodlands dominated by Red Gums (i.e. trunk diameters of at least 0.8 m). These trees are each marked on the aerial photograph with yellow circles and numbers. They are mostly more than 20 m tall and over a century old. Tree 5 is a possible hybrid. Additional characteristics of the large old trees are tabulated below, with Tree 1 being the Swamp Gum:

Tree label:	1	2	3	4	5	6	7	8	9	10
Trunk diameter:	255 cm	301 cm	319 cm	248 cm	281 cm	378 cm	405 cm	279 cm	320 cm	250 cm
Health:	Fair	Good	V.good	Good	Good	V.good	V.good	V.good	V.Good	Good

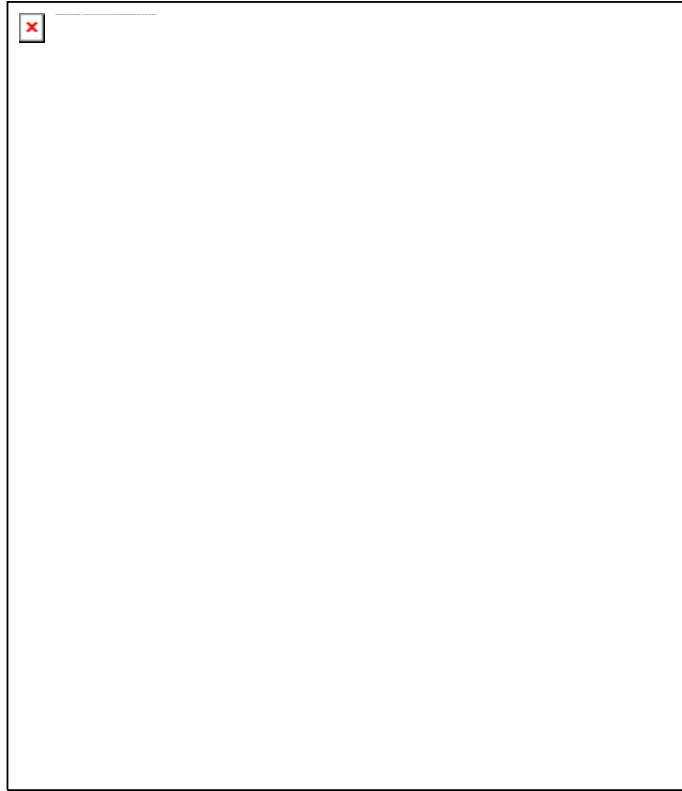
Tree label:	11	12	13	14	15	16	17	18	19
Trunk diameter:	258 cm	270 cm	270 cm	260 cm	320 cm	251 cm	300 cm	389 cm	347 cm
Health:	Good	Good	Fair	Good	V.good	Good	Good	Good	Fair

In addition to the large old trees, there are forty-nine smaller River Red Gums and three smaller Swamp Gums. These trees are marked with blue circles on the aerial photograph. They represent multiple generations of naturally occurring trees, some of them more than a century old. The characteristics of these trees are tabulated below:

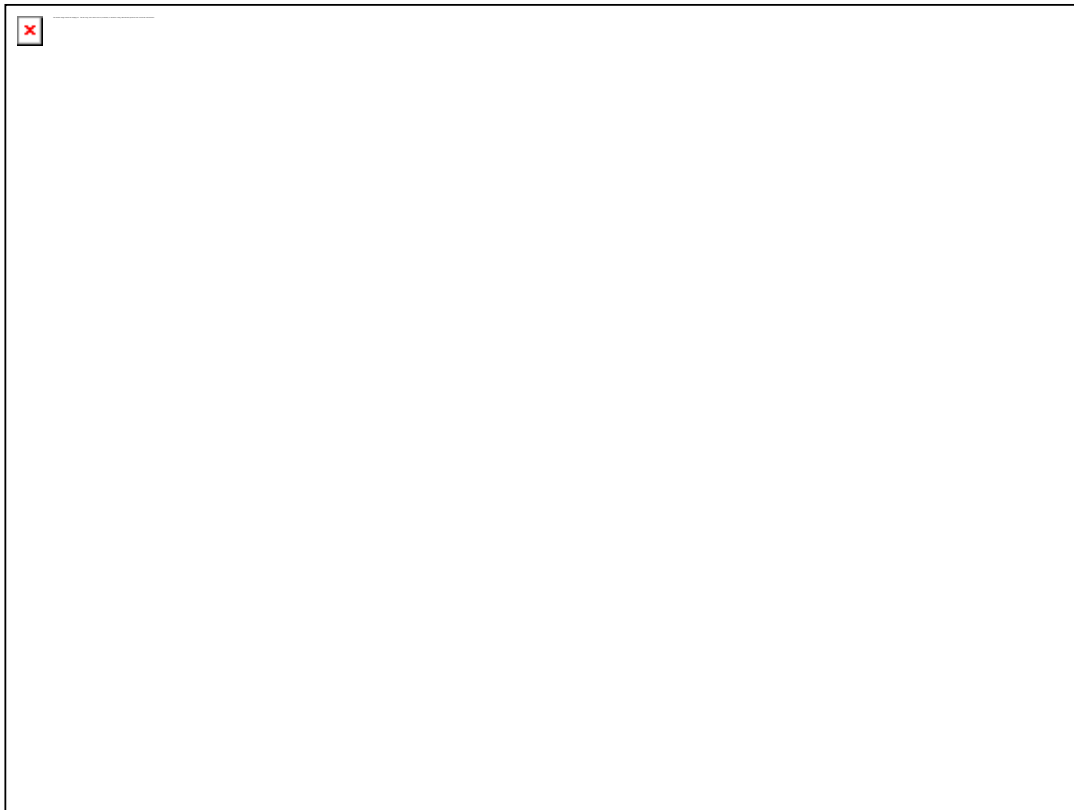
Species:	<i>Eucalyptus camaldulensis</i>				<i>Eucalyptus ovata</i>			
Health Rating:	Very Good	Good	Fair	Poor	Very Good	Good	Fair	Poor
Number of trees:	4	13	23	9	0	1	2	0

The park's eucalypts have suffered in recent years from drought, insect attack and possum browsing. Unfortunately, the locally endangered Swamp Gums have fared worst, with three in fair health and one multi-stemmed specimen in good condition (right at the centre of the park). The extent of insect damage has been heightened as an indirect result of the paucity of shrubs in the park, which favours the aggressive Noisy Miner to the exclusion of smaller insect-eating birds.

Photographs 1 and 2 below provide representative views of the park's River Red Gums, taken on 14th January 2005. The locations and orientations of the camera are marked on the aerial photograph on page 428. The main purpose of the photographs is to provide a basis for detecting change in the extent of dieback in the tree crowns.



Site 44, Photo 1. A view of Tree 16, whose health was rated as good (barely).



Site 44, Photo 2. Another representative view of eucalypts (including trees 17 and 18) for monitoring the extent of dieback.

Ecological links with other land

Belmont Park is rather ecologically isolated from other habitat for native flora or fauna. There is a tiny patch of Grassy Woodland in the Outer Circle Railway corridor (Site 31) 300 m to the southwest, and otherwise, the only remnant vegetation within 2 km comprises a few isolated River Red Gums and a small number of individual understorey plants. There is therefore very little ecological linkage between Belmont Park and any other area of native vegetation.

Former habitat type

The pre-European vegetation of Belmont Park would most likely have included Grassy Woodland (EVC 175) in the south, grading into Plains Grassy Woodland (EVC 55) to the north.

Flora of special significance

The significant plant species below were found during the fieldwork for this study. The conservation status ratings in the table (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status in Boroondara	Species Name	Notes
Endangered	<i>Eucalyptus ovata</i>	Four individuals, one a large old tree.
Vulnerable	<i>Austrodanthonia geniculata</i>	Abundant in patches of up to hundreds of m ² .

Full flora list

The table below lists the wild plant species recorded by the author in Belmont Park on 14/1/05. In the 'Abundance' column:

D = the species is dominant in its vegetation stratum;

✓ = moderate numbers; and

M = many plants;

– = very few plants.

Species Name	Abundance	Species Name	Abundance	Species Name	Abundance
Wild indigenous species					
<i>Austrodanthonia geniculata</i>	D	<i>Goodenia ovata</i>	✓	<i>Ehrharta erecta</i>	✓
<i>Austrodanthonia racemosa</i>	M	<i>Kunzea ericoides</i> s.l.	–	<i>Lolium perenne</i>	✓
<i>Cotula australis</i>	✓	<i>Lomandra longifolia</i>	✓	<i>Paspalum dilatatum</i>	–
<i>Eucalyptus camaldulensis</i>	D	<i>Poa labillardierei</i>	✓	<i>Pennisetum clandestinum</i>	✓
<i>Eucalyptus ovata</i>	✓	<i>Wahlenbergia communis</i> s.l.	✓	<i>Pitiosporum undulatum</i>	–
<i>Microlaena stipoides</i>	✓	Other planted species			
<i>Muellerina eucalyptoides</i>	✓	<i>Arbutus unedo</i>	–	<i>Plantago coronopus</i>	✓
<i>Portulaca oleracea</i> *	✓	<i>Corymbia maculata</i>	✓	<i>Plantago lanceolata</i>	✓
Planted indigenous species					
<i>Acacia implexa</i>	✓	<i>Eucalyptus ?botryoides</i>	✓	<i>Poa annua</i>	✓
<i>Acacia melanoxylon</i>	✓	<i>Eucalyptus sideroxylon</i> s.l.	–	<i>Polycarpon tetraphyllum</i>	✓
<i>Dianella longifolia</i> s.l.	✓	<i>Eucalyptus</i> sp.	–	<i>Polygonum aviculare</i> s.l.	✓
<i>Eucalyptus camaldulensis</i>	✓	Weeds			
<i>Eucalyptus cladocalyx</i>	✓	<i>Agrostis capillaris</i>	–	<i>Romulea rosea</i>	✓
<i>Eucalyptus melliodora</i>	✓	<i>Arctotheca calendula</i>	✓	<i>Sporobolus africanus</i>	✓
		<i>Bromus catharticus</i>	✓	<i>Trifolium dubium</i>	✓
		<i>Cynodon dactylon</i>	M	<i>Ulmus</i> aff. <i>procera</i>	✓
				<i>Vulpia bromoides</i>	✓
				<i>Acacia elata</i>	–

* *Portulaca oleracea* is doubtfully indigenous to the Melbourne area.

Fauna of special significance

The significant fauna species in the list below have been observed at Belmont Park. The conservation status ratings (e.g. vulnerable or endangered) are explained in Section 2.5.2 (page 18).

Conservation Status		Species Name	Last Record
Melbourne	Boroondara		
Endangered	Occasional Visitor	Cockatiel	1998

Conservation Status		Species Name	Last Record
Melbourne	Boroondara		
	Endangered	Crimson Rosella	2005
	Vulnerable	Australian Hobby	1998
	Vulnerable	Musk Lorikeet	2005
	Vulnerable	Little Lorikeet	2005
	Vulnerable	Eastern Rosella	2004
	Vulnerable	Tawny Frogmouth	2005
	Vulnerable	Laughing Kookaburra	2005

Full fauna list

The following list shows the most recent year in which each species has been recorded. Asterisks indicate introduced species. The Noisy Miner is the only species for which breeding has been confirmed.

Butterflies		Galah	1998	White-plumed Honeyeater	1998
*Cabbage White	2005	Sulphur-crested Cockatoo	1998	Magpie-lark	2005
Common Brown	2005	Cockatiel	1998	Willie Wagtail	1998
Common Grass-blue	2005	Rainbow Lorikeet	2005	Grey Butcherbird	2004
		Musk Lorikeet	2005	Australian Magpie	2005
Mammals		Little Lorikeet	2005	Pied Currawong	2001
Common Brushtail Possum	2005	Crimson Rosella	2005	*House Sparrow	1988
Common Ringtail Possum	1990	Eastern Rosella	2004	Silvereye	1988
		Tawny Frogmouth	2005	*Common Blackbird	2001
Birds		Laughing Kookaburra	2005	*Common Starling	1998
Australian Hobby	1998	Red Wattlebird	2004	*Common Myna	2004
*Spotted Turtle-Dove	2000	Noisy Miner	2005		

Bird census results

One twenty-minute bird census was carried out as part of the bird survey by David Lockwood on 3/10/04. He recorded five native species and no introduced species – by far the lowest number of species of any census in this study. The species counts were Rainbow Lorikeet (18), Noisy Miner (17), Eastern Rosella (8), Australian Magpie (2) and Red Wattlebird (1). This represents a dysfunctional bird community that would be expected to lead to tree dieback from inadequate visitation by small, insect-eating birds. The abundance of Noisy Miners is a major contributor to this dysfunction.

Fauna habitat

Belmont Park's open, park-like vegetation attracts the Noisy Miner, so recent plantings of shrubs are desirable for restoring a balance among bird species. Fledgling Noisy Miners were observed, indicating that this species breeds in the park.

Flowering Ironbark (*Eucalyptus sideroxylon* s.l.) and Yellow Gum (*Eucalyptus leucoxylon*) were seen to attract large numbers of Noisy Miner, Rainbow Lorikeet and Musk Lorikeet, and smaller numbers of Little Lorikeet. The Musk Lorikeet and Little Lorikeet are nomadic species that probably visit Belmont Park only when there is prolific eucalypt nectar available.

There are many hollows in the park's River Red Gums, and several hollows were observed to be occupied by wildlife (including by Eastern Rosella and Rainbow Lorikeet).

The presence of Creeping Mistletoe indicates that the Mistletoebird must also have visited, although none was observed during the survey.

Site significance ratings

The following is an assessment against the BioSites criteria of the Department of Sustainability & Environment (Amos 2004).

Rare or threatened plants

Belmont Park's population of the locally vulnerable Knead Wallaby-grass (*Austrodanthonia geniculata*) contains hundreds of plants, and is quite viable. It is the largest population of the species found in this study. A viable population of a locally threatened species gives the site **Local** significance under BioSites criterion 3.1.5.

Although there are only four individuals of Swamp Gum (*Eucalyptus ovata*) in Belmont Park, this is a substantial population in the perspective of Boroondara. The only two sites in the municipality that are known to have more than four Swamp Gums are Markham Reserve and the Alamein railway line near Summerhill Park – neither with many more Swamp

Gums than at Belmont Park. Therefore, the Belmont Park Swamp Gums fit the description of 'An important site or population of the taxon in the local area'. This meets BioSites criterion 3.1.5 of the Department of Sustainability & Environment (Amos 2004) for a site of **Local** significance.

Large old trees

The BioSites criteria do not recognise any biological significance of eucalypts solely on the basis of size. Belmont Park's remnant trees are therefore not significant under the BioSites criteria, but this should not be taken to imply that they are not significant when considered against criteria related to heritage or aesthetics.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as the ones of interest here. However, the latest version states, 'Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats'. The last sentence is not correct in the context of Belmont Park, or Boroondara more generally.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Eucalypt dieback disease due to possums, psyllids, leaf skeletonisers, leaf miners, drought stress or other causes. Psyllid damage was quite evident at the time of the site inspection (14/1/05).	Trees	Moderate	Current
Noisy Miners chasing away smaller bird species, thereby exacerbating tree dieback.	Bird fauna; Trees	Moderate	Current
Environmental weeds. The species of concern are: <ul style="list-style-type: none"> • Serious: Four-leafed Allseed (<i>Polycarpon tetraphyllum</i>), Indian Rat-tail Grass (<i>Sporobolus africanus</i>); • Moderately serious: Cape Weed (<i>Arctotheca calendula</i>), Prairie Grass (<i>Bromus catharticus</i>), Couch (<i>Cynodon dactylon</i>), Panic Veldt-grass (<i>Ehrharta erecta</i>), Perennial Rye-grass (<i>Lolium perenne</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Buck's-horn Plantain (<i>Plantago coronopus</i>), Ribwort (<i>Plantago lanceolata</i>), Annual Meadow-grass (<i>Poa annua</i>), Common Onion-grass (<i>Romulea rosea</i>), Suckling Clover (<i>Trifolium dubium</i>), Squirrel-tail Fescue (<i>Vulpia bromoides</i>). 	All	Low to Moderate	Current

Past management and revegetation

The earliest management of the park appears to have involved removal of all shrubs and small trees, to create a very open landscape. Some trees were subsequently planted, including Australian natives and exotic species. In recent years, some mulched beds have been created beneath clusters of remnant River Red Gums. These beds provide better conditions for the tree roots, and the shrubs that have been planted may attract insect-eating birds that will help reduce tree dieback.

Future management and revegetation

- During periods of drought, the remnant eucalypts should be inspected each summer to check whether irrigation is necessary to avoid deaths, and whether protection against possums needs to be installed.
- Planting a few more Swamp Gums of local provenance would help the security of this locally endangered species.
- Additional planting of indigenous shrubs in moderately dense blocks (not strips) may encourage small insectivorous bird species to inhabit the area. Existing plantings that are in strips would ideally be broadened. The recently indigenous plantings have used appropriate species (see under the heading, 'Full flora list'), and these could be augmented by Hedge Wattle (*Acacia paradoxa*), Sweet Bursaria (*Bursaria spinosa*) and Golden Wattle (*Acacia pycnantha*). Additional suitable species can be selected from the list for Plains Grassy Woodland in Appendix C.
- The frequency of mowing should be minimised to avoid unnecessary soil compaction and consequent harm to the park's eucalypts. One of the cuts in each year should be in late December or January with the aim of reducing proliferation of Indian Rat-tail Grass (*Sporobolus africanus*).

Monitoring

No pre-existing data appears to be available to allow monitoring trends in the ecological values of this site.

The following items have been gathered to provide a baseline for future monitoring:

- Photos 1 and 2 on page 430, for monitoring eucalypt dieback. Repeat every two years, approximately. Investigate causes and possible solutions if dieback is found to worsen;
- The tree health ratings in the section headed 'Site description'. Repeat every four years (at least by sampling some of the trees, not necessarily all of them);
- The flora list for the park, as provided beneath the heading 'Full flora list' above. Repeat at intervals of five to ten years. Check for loss or decline of indigenous species and shifts in the threat ratings of weeds;
- The weed severity ratings in the table under the heading 'Threats'. Repeat in conjunction with the previous task.

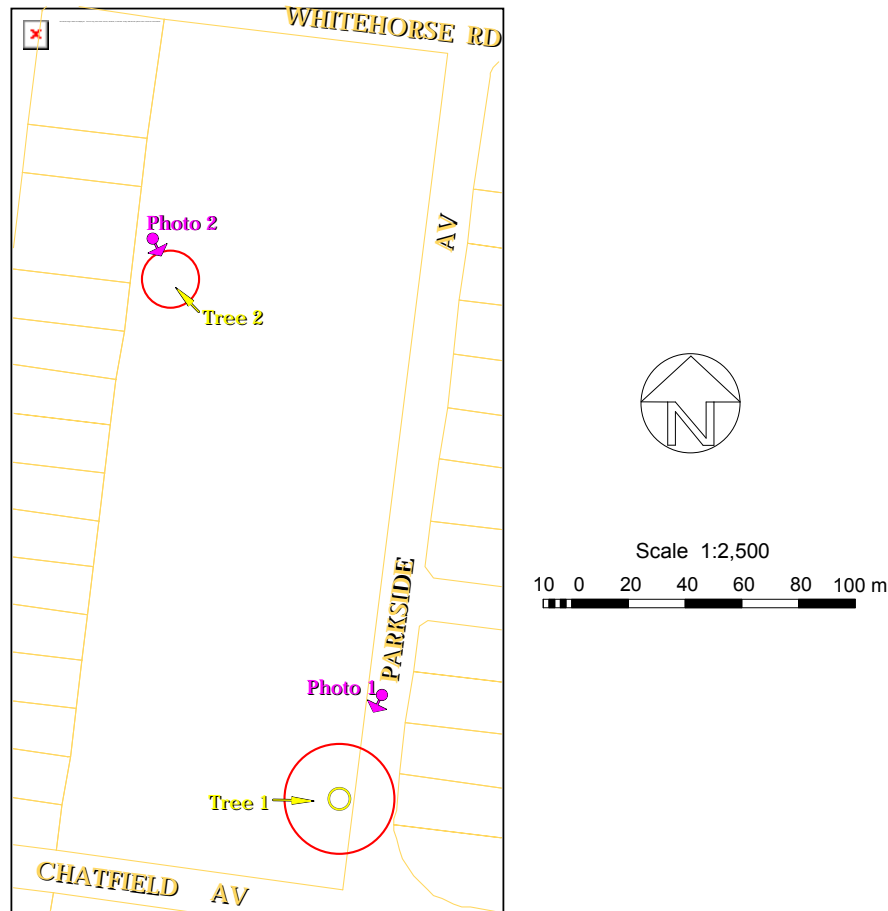
Information sources used in this assessment

- A vegetation and habitat survey by Dr Lorimer for four hours on 14th January 2005, using this study's standard approach described in Section 2.3. This included:
 - Compilation of a list of indigenous and introduced plant species, including all species' abundances and the threat level of each weed species;
 - Mapping and health assessment of every remnant tree, and measurement of all medium or large remnant trees;
 - Mapping, assessment and documentation of populations of plant species that are rare in the site or more generally;
 - Photography for monitoring;
 - Incidental fauna observations; and
 - Checks for fauna habitat, ecological threats and management issues;
- A daytime bird survey of the site by David Lockwood on 3/10/04 according to the protocol discussed in Section 2.4.1, including a twenty-minute bird census;
- A search for information from the Department of Sustainability & Environment's flora and fauna databases, including fauna records by Steve Rowe in 1988, John Seebeck in 1990 and an anonymous observer in 1998, 2000 and 2001;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Site 56. Deepdene Park's River Red Gums, Balwyn

Two remnant River Red Gums in a recreation reserve. Melway ref. 46 A8.

Site Biological Significance Level: *Below the BioSites Rating Threshold*



Boundaries

This site comprises the two circles shown in red above, which are centred on two remnant River Red Gums. The circle around 'Tree 1' has a radius of 19.4 m, or eighteen times the tree trunk diameter, corresponding to the Tree Protection Zone recommended by Matheny and Clark (1998) for over-mature trees belonging to species that are sensitive to root disturbance. The circle around 'Tree 2' has a radius of 10 m, equal to fifteen times the diameter of the tree trunk, following the recommendation of Matheny and Clark for mature trees belonging to species that are sensitive to root disturbance.

Land use & tenure

Deepdene Park is a Council recreation reserve with sporting facilities. The site boundary surrounding Tree 2 extends across Parkside Avenue, a residential street.

Physical features

Site area: 0.15 hectares.

Elevation: 56 m at Tree 1; 65 m at Tree 2.

Landform: Floor of a drainage line in lightly undulating terrain.

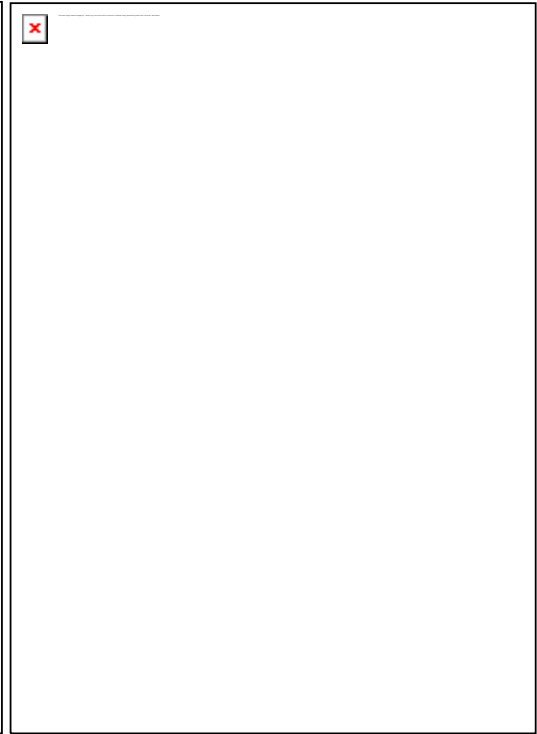
Slope: Slight.

Soil type: Shallow alluvium, probably with yellow-brown mottled clay subsoil.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek formation, which is dominated by siltstone.



Site 56, Tree 1.



Site 56, Tree 2 (centre foreground).

Tree descriptions

Both of the trees in this site are River Red Gums (*Eucalyptus camaldulensis*). The one labelled 'Tree 1' on the aerial photograph is listed as Tree 35 in the 'Boroondara Significant Tree Study' report by John Patrick Pty Ltd (2001), for its size and aesthetic appeal and the prominence of its corner location. (In these regards, the tree does not seem as noteworthy as many other trees described in this report that were not listed by John Patrick Pty Ltd.) It has a trunk diameter of 1.08 metres, thereby qualifying as a large old tree according to the Department of Sustainability & Environment's criterion for woodlands dominated by Red Gums (i.e. trunk diameters of at least 0.8 m). It is in good health. It supports a small amount of the indigenous Creeping Mistletoe (*Muellerina eucalyptoides*).

Comparing the photograph of Tree 1 above (taken on 11th February 2005) with the corresponding photograph from December 2000 in the Significant Tree Study report, there has been a small increase in foliage density in the intervening 4¼ years.

As implied in the Significant Tree Study report, Tree 1 is at risk of debilitation from the high density of young trees that have been planted around it. The young trees include River Red Gums and an incoherent mixture of exotic and Australian native trees, and they are progressively degrading the visual prominence for which Tree 1 was listed. It is already impossible to get a clear view of Tree 1.

Tree 2 is substantially smaller, with a trunk diameter of 67 cm. Its health is fair (approaching good). It has at least two hollows that would suit occupation by native birds or bats.

Ecological links with other land

Deepdene Park is rather ecologically isolated from other habitat for native flora or fauna. The only substantial area of remnant vegetation for more than 2 km around is Belmont Park (Site 55), 100 m southwest of Tree 1. The only fauna expected in the park would be typical of suburban residential neighbourhoods generally.

Former habitat type

The pre-European vegetation at the locations of Tree 1 and Tree 2 would have been Creepline Grassy Woodland (EVC 68).

Site significance rating

The Department of Sustainability & Environment's BioSites criteria (Amos 2004) do not recognise any biological significance of River Red Gums in the absence of native understorey, regardless of the trees' size.

Deepdene Park's remnant trees are therefore not significant under the BioSites criteria, but this should not be taken to imply that they are not significant when considered against criteria related to heritage or aesthetics.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as the ones of interest here. However, the latest version states, '*Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats*'. The last sentence is not correct in the context of Leigh Park, or Boroondara more generally.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Debilitation of Tree 1 due to competition from dense tree plantings within its root zone.	Large old tree	Moderate	Current
Eucalypt dieback disease due to possums, psyllids, leaf skeletonisers, leaf miners, drought stress or other causes.	Trees	Low to moderate	Current

Recommendation

- Reconsider the visual and arboricultural aspects of the trees planted within approximately twenty metres of Tree 1. If no action is taken, Tree 1 may not be worthy of retaining its inclusion in the Significant Tree list when the list is next reviewed.

Information sources used in this assessment

- A site inspection on 11th February 2005 using this study's standard approach described in Section 2.3.5, including a search for native vegetation, then mapping, measuring and photographing the trees and assessing their health;
- The 289-page '*City of Boroondara Significant Tree Study*' by John Patrick Pty Ltd, dated May 2001;
- An inspection of the Department of Sustainability & Environment's flora and fauna databases, yielded no data;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

Site 57. Bundy Tree on Belmore Rd, Balwyn North

One large, remnant Bundy tree in a car park, the only member of its species known in Boroondara. Melway ref. 46 E5.

Significance Level: *Local*



Boundaries

This site is taken to be a circle of radius 17.5 metres around the base of the large Bundy (*Eucalyptus goniacalyx*) depicted in the photograph above, located in the car park at 1 Belmore Rd, Balwyn North (known within Council as 'Car Park No. 1'). The radius of the circle is eighteen times the diameter of the tree trunk, corresponding to the Tree Protection Zone recommended by Matheny and Clark (1998) for over-mature trees belonging to species that are sensitive to root disturbance.

Land use & tenure: The tree is located in the car park, but the site extends across almost the entire backyard of the property to the east, and small segments of the property to the west and the drainage reserve to the north.

Physical features

Site area: 962 m²s

Elevation: 69 metres

Landform: Lower slope of a very shallow valley in undulating terrain.

Slope: A 1:10 gradient with a north-northeasterly aspect.

Soil type: Light grey loam over yellow-brown mottled clay subsoil.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek formation, which is dominated by siltstone.

Tree description

The tree in this site is Boroondara's only known member of its species, *Eucalyptus goniacalyx* or Bundy, which is a common species in the outer eastern and northeastern suburbs. Being such an outlier, one might question whether it was planted rather than being natural. However, the tree is so large that it probably pre-dates local plantings of Australian trees, and the species is not normally planted for horticulture or amenity because it is poorly suited to such purposes. It has a height of 19 m (measured by clinometer), a trunk diameter of 97 cm and a crown diameter of 18 m. This is a very large Bundy on a regional scale, even compared with areas where the species is abundant. It qualifies as a 'large old tree' by the criteria of the Department of Sustainability & Environment.

The tree is in very good health for a Bundy. Dead wood has been professionally removed and the tree is fairly well balanced. Typical of its species, it has lesions from dropped limbs and a substantial number of borer holes. Some recent borer holes on the eastern bole should be monitored in case they threaten to weaken the tree.

The photograph of the tree on the previous page should assist future monitoring of the tree's health. The author has some additional photographs.

Ecological links with other land

The remnant trees and planted Australian plants of Stradbroke Park (Site 33) are less than 200 m to the west and northwest of the Bundy. Some native birds and insects are likely to fly between Stradbroke Park and the Bundy, either directly or via the Glass Creek drainage reserve. The drainage reserve's vegetation (seen in the background of the photograph on the previous page) is quite unnatural but may still have some limited value for fauna movements (which were not investigated in this study).

Habitat type

The site's pre-European vegetation would have been Plains Grassy Woodland (EVC 55), of which Bundy is a very unusual constituent.

Site significance rating

Rare or threatened plants

As the only known member of its species within many kilometres, and being an unusually large, healthy specimen of the species, the Bundy fits the description of 'An important site or population of the taxon in the local area'. This meets BioSites criterion 3.1.5 of the Department of Sustainability & Environment (Amos 2004) for a site of **Local** significance.

Recommendations

- The Bundy is such a significant tree, and so susceptible to borer damage, that it should be checked by an arborist at least every second year.
- Any proposal to re-pave the car park, or change the parking arrangements, should be checked with an arborist first.
- Any proposed development in the backyard of the property to the east (3 Belmore Rd, Balwyn North) that comes before Council should be considered against the potential impact on the Bundy.

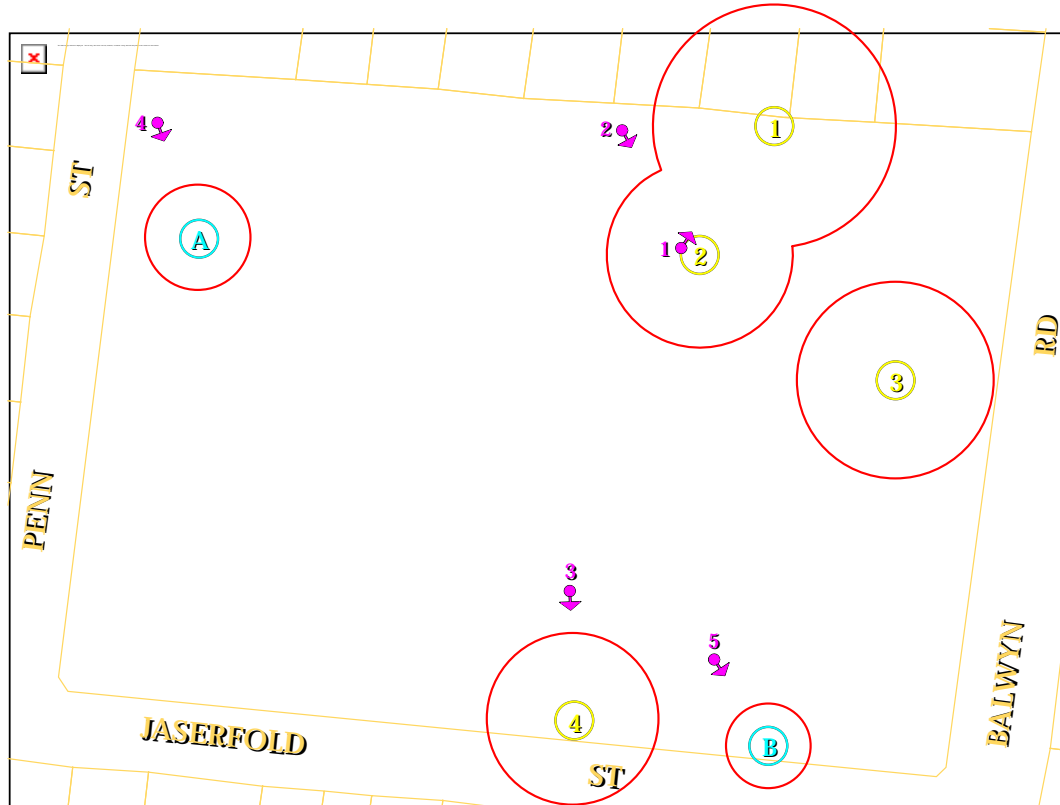
Information sources used in this assessment

- A site inspection on 16th November 2004 using this study's standard approach for scattered trees described in Section 2.3.5;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.


Site 58. Leigh Park, Balwyn North


Large old River Red Gums surrounding a public oval. Melway ref. 46 E1.


Site Biological Significance Level: *Below the BioSites Rating Threshold*



LEGEND

 Numbered photo point

 Numbered trees with trunk diam. >0.8 m

 Letter-labelled trees with trunk diam. <0.8 m

Labelled trees are all River Red Gums.



Scale 1:1,500
5 0 10 20 30 40 50 m

Boundaries

This site boundary is formed from circles drawn around each of six River Red Gums, as shown in red above. The radii of the red circles around trees labelled 1 to 4 are equal to eighteen times the diameter of the associated tree trunks (tabulated below), corresponding to the Tree Protection Zone recommended by Matheny and Clark (1998) for over-mature trees belonging to species that are sensitive to root disturbance. The radii for trees labelled A and B are fifteen times the corresponding trunk diameters, as recommended by Matheny and Clark for mature trees belonging to species that are sensitive to root disturbance.

Land use & tenure

Leigh Park is a Council recreation reserve with an oval and playground. The site extends into four adjoining backyards near Tree 1, and sections of Jaserfold St.

Physical features

Site area: 0.6 hectares

Elevation: 40 m to 44 m

Landform: The floor of a shallow natural basin in undulating terrain.

Slope: Slight, draining to the north.

Soil type: Light grey loam over yellow-brown mottled clay subsoil.

Underlying geology: The bedrock is Silurian sedimentary rock of the Andersons Creek formation, which is dominated by siltstone.

Tree descriptions

Four of Leigh Park's six River Red Gums qualify as large old trees according to the Department of Sustainability & Environment's criterion for woodlands dominated by Red Gums (i.e. trunk diameters of at least 0.8 m). These trees are each marked on the aerial photograph with yellow circles and numbers. They are estimated to be over a century old. Their characteristics are tabulated below:

Tree number:	1	2	3	4
Trunk diameter:	142 cm	109 cm	115 cm	101 cm
Health:	Good	Good	Good	Very good

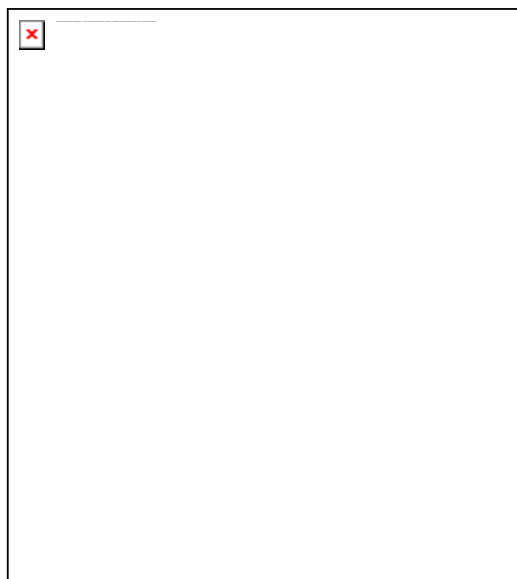
Tree 1 has at least two hollows that would suit occupation by native birds or bats.

In addition to the large old trees, there are two other River Red Gums, labelled 'A' and 'B' on the aerial photograph, whose characteristics are tabulated below:

Tree label:	A	B
Trunk diameter:	74 cm	60 cm
Health:	Fair-good	Good

The five photographs on the following pages show each of the River Red Gums, taken on 7th February 2005. The locations and orientations of the camera are marked on the aerial photograph on page 440. The main purpose of the photographs is to provide a basis for detecting change in the trees' structure and the extent of dieback in the tree crowns. Unfortunately, strong wind at the time of the photographs has slightly distorted the density of foliage in the crowns.

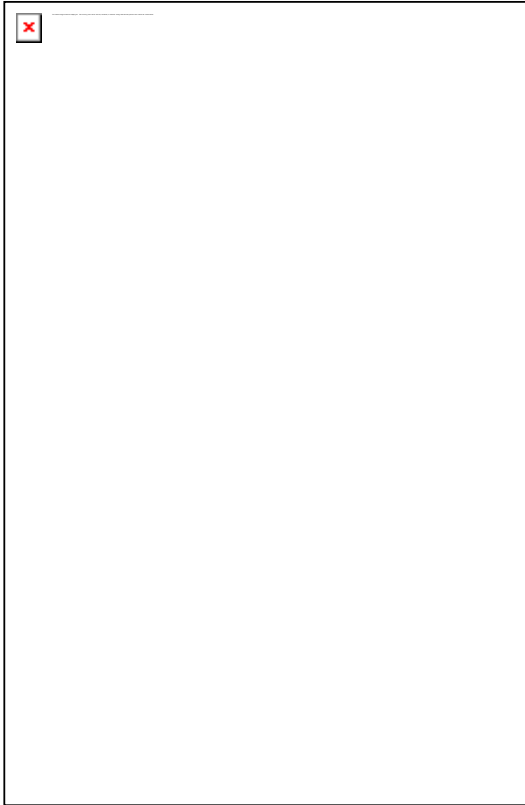
Photo 2 also depicts the unusual context of Tree 2, which is actually inside the boundary of the oval. This shows a longstanding appreciation of the tree by sportspeople and grounds staff, who have accepted its presence within the playing area for the whole period of the oval's existence. Tree 2 adds a distinctive aspect to the oval, in the same manner as the famous Lime Tree that, until January 2005, grew within the boundary rope of the Kent County Cricket Ground in Canterbury, England. Such a context gives Tree 2 added significance, but the nature of that significance is not of a biological nature and therefore outside the parameters of the present study.



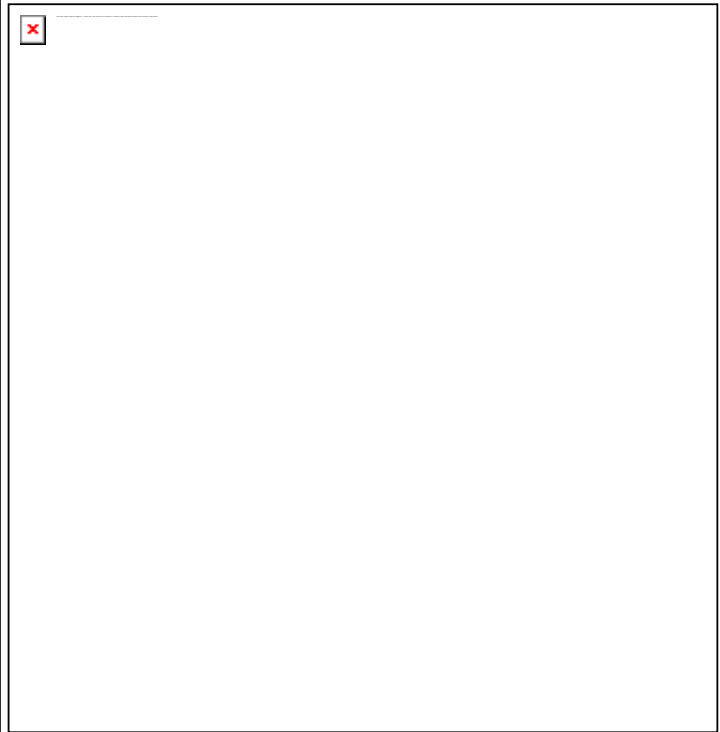
Site 58, Photo 1. Tree 1.



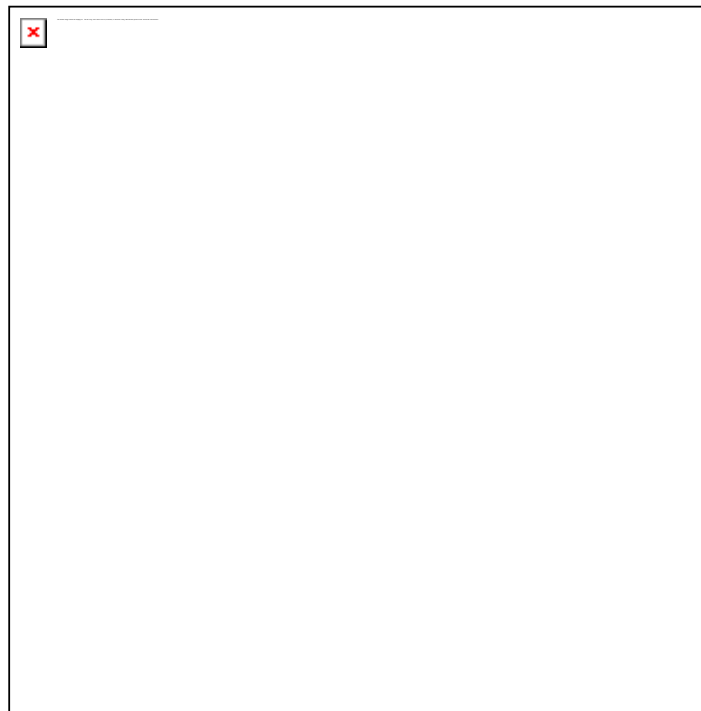
Site 58, Photo 2. Tree 2 (centre) with Tree 3 in the left background



Site 58, Photo 3. Tree 4.



Site 58, Photo 4. Tree A, with a recently fallen limb.



Site 58, Photo 5. Tree B.

Ecological links with other land

Leigh Park is rather ecologically isolated from other habitat for native flora or fauna. No other remnant vegetation was detected within 1 km of Leigh Park, other than the usual indigenous species that persist in suburban lawns.

Former habitat type

The pre-European vegetation of Leigh Park would have been Plains Grassy Woodland (EVC 55), probably with a narrow strip of Creekline Grassy Woodland (EVC 68) running northward from somewhere near the current-day cricket pitch.

Site significance rating

The BioSites criteria do not recognise any biological significance of River Red Gums in the absence of native understorey, regardless of the trees' size.

Leigh Park is therefore not significant under the BioSites criteria, but this should not be taken to imply that its centuries-old trees are not significant when considered against criteria related to heritage or aesthetics.

A previous version of the BioSites criteria did recognise the significance of individual trees of exceptional age, such as the ones of interest here. However, the latest version states, *'Whilst individual organisms of unusual age or size may have intrinsic values for which we wish to conserve them they are of less relevance to conservation objectives if they occur as isolated individuals. Usually, however such individuals will survive only in old-growth habitats'*. The last sentence is not correct in the context of Leigh Park, or Boroondara more generally.

Threats

The following threats to the site's ecological values are presented in a form to suit the Department of Sustainability & Environment's 'BioSites' database.

Threat	Natural assets affected	Severity	When?
Eucalypt dieback disease due to possums.	Trees	Moderate	Current
Eucalypt dieback disease due to causes other than possums, such as psyllids, leaf skeletonisers, leaf miners or drought stress.	Trees	Low to moderate	Current

Recommendations

- During periods of drought, the remnant eucalypts should be inspected each summer to check whether irrigation (or more irrigation) is necessary to avoid deaths, and whether protection against possums needs to be installed.
- Consider Tree 2 (at least) for nomination as a 'significant Tree' when the current list is reviewed. It appears to be of greater significance for heritage and visual amenity than many trees already on the list (e.g. Tree 35 on the list).

Information sources used in this assessment

- A site inspection on 7th February 2005 using this study's standard approach described in Section 2.3.5, including a search for native vegetation, then mapping, measuring and photographing the trees and assessing their health;
- An inspection of the Department of Sustainability & Environment's flora and fauna databases, yielded no data;
- Aerial photography from August 2004;
- The Department of Sustainability & Environment's BioMaps of the area;
- Maps of geology and topography produced by agencies of the Victorian government.

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Appendix A – Inventory of Vegetation Communities

The characteristics and conservation status of the various vegetation types identified in Boroondara during this study are described below. They are classified according to the Department of Sustainability & Environment's system of Ecological Vegetation Classes, or EVCs. The plant species quoted are typical for the Melbourne region (particularly Boroondara) and are often not representative of other regions.

Note that EVCs that are present in Yarra Bend Park but nowhere else in Boroondara are not included here because Yarra Bend Park was excluded from the fieldwork in this project.

EVC 47 – Valley Grassy Forest

Quick recognition: A tree canopy dominated by *Eucalyptus melliodora*, often mixed with *E. radiata*, not on swampy or poorly drained soil (which would suggest Swampy Riparian Woodland). *E. rubida* is not always present, but when it is, it is a very good indicator of this EVC. The ground layer is very grassy and herbaceous, as distinct from the related Valley Heathy Forest, which has more woody and tough ground flora species such as *Hibbertia riparia* and *Platylobium obtusangulum*.

Position in the landscape: Flanks and lower slopes of low ridges and hills where annual average precipitation exceeds approximately 700 mm. Grassy Forest (EVC 128) occupies equivalent positions in areas of higher winter rainfall.

Tree canopy: Crowns separated slightly or just touching each other, approximately 20 m tall in Boroondara and surrounding areas. *Eucalyptus melliodora* is always present in natural stands, often mixed with *Eucalyptus radiata*.

Lower trees: Not dense, but fairly rich in species: *Exocarpos cupressiformis*, *Acacia mearnsii*, *Acacia melanoxylon* and *Acacia implexa* are common.

Shrubs: Probably originally fairly sparse in Boroondara, except for occasional patches of denser *Acacia paradoxa*, *Kunzea ericoides* and *Cassinia* species, but now reduced to a few *Bursaria spinosa* across the whole range in Boroondara.

Vines: Light twiners such as *Billardiera scandens* and *Comesperma volubile* can be fairly common, but they have all been lost in Boroondara.

Ferns: Naturally scarce other than for patches of *Pteridium esculentum* or *Adiantum aethiopicum* where the vegetation approaches Herb-rich Foothill Forest or similar EVCs, but reduced in Boroondara to a single patch of *Pteridium esculentum*.

Ground flora: Practically all lost from Boroondara due to clearing, except for Winfield Road Reserve in Balwyn North. Originally, the ground flora would have been dense and grassy, often with many lilies. *Themeda triandra* is usually one of the most dominant grasses in intact stands, along with *Microlaena stipoides*, *Austrostipa rudis* and species of *Poa* and *Austrodanthonia*. *Lomandra longifolia* is also often abundant. The most abundant lilies are *Arthropodium strictum*, *Burchardia umbellata* and *Dianella revoluta*. Other species that are more common in Valley Grassy Forest than similar EVCs are *Galium* species, *Ranunculus lappaceus* and *Veronica* species (although *V. gracilis* is also common in Valley Heathy Forest). In addition to the Veronicas, other creepers such as *Dichondra repens* and *Acaena novae-zelandiae* can be quite abundant. Daisies such as *Brachyscome decipiens* were apparently fairly common once, but now rare (and absent within Boroondara).

Conservation Status: Valley Grassy Forest is represented in Boroondara by a mown hillside in Winfield Road Reserve, Balwyn North, as well as tiny, degraded vestiges in South Surrey Park and by a few trees beside Back Creek at Cornell St in Camberwell. The conservation status is listed as 'vulnerable' in the Gippsland Plain bioregion.

EVC 53 – Swamp Scrub

Swamp Scrub can occur either naturally or as regrowth following clearing of floodplain woodlands. It is possible that the solitary, degraded occurrence in Boroondara is in the latter category.

Quick recognition: A dense, tall scrub of *Melaleuca ericifolia*, sometimes punctuated with scattered *Eucalyptus ovata* or *Acacia melanoxylon* (or *E. cephalocarpa*, east of Boroondara). The understorey is quite sparse because of the dense shade. The ground is boggy for most of the year.

Position in the landscape: Poorly drained, infertile patches of floodplains.

Canopy: As described above.

Shrubs: Usually quite sparse, and totally absent from Boroondara (probably due to clearing). *Coprosma quadrifida* is fairly common outside Boroondara, but other shrubs of similar size are uncommon. The main smaller shrubs that would once have occurred are *Goodenia ovata* and *Senecio minimus*.

Vines: Indigenous vines are naturally very sparse or absent, but Japanese Honeysuckle and Blackberry often invade and become abundant.

Ferns: Absent from Boroondara's only stand, but in intact stands to the east, *Blechnum minus* can be fairly abundant and *Cyathea australis* is sometimes present in small numbers.

Ground flora: Moderately to very sparse in nature, depending on the canopy density, but absent from Boroondara due to past clearing and weed invasion. The species present in intact stands to the east usually include many of the following: *Phragmites australis*, *Lomandra longifolia*, *Isolepis inundata*, *Lobelia anceps*, *Centella cordifolia* and various species of *Juncus*. Nonvascular plants may have greater cover than vascular ground flora.

Conservation Status: The only representation in Boroondara is a 900 m² patch at Dorothy Laver Reserve in Glen Iris (Site 23, page 224). The vast majority of native vegetation on floodplains throughout the Melbourne region has been cleared, grazed or excavated for drainage or sewerage. The pockets of Swamp Scrub are consequently only tiny compared with what would once have existed, and much of what now exists may be artificial as a result of clearing of Swampy Woodland or Floodplain Riparian Woodland. The Department of Sustainability & Environment rates the conservation status of Swamp Scrub as 'endangered' in the Gippsland Plain bioregion.

EVC 55 – Plains Grassy Woodland

Quick recognition: Woodland dominated by a pure (or near-pure) stand of *Eucalyptus camaldulensis* with grassy understorey rich in lilies and without wetland plant species. If *Eucalyptus melliodora* is present, it would suggest Grassy Woodland rather than this EVC.

Position in the Boroondara landscape: Not on ridgetops (where Grassy Woodland occurs on Tertiary sands) and not in alluvial valleys or floodplains, but covering everywhere in between over most of Boroondara. At the eastern edge of the municipality, it gives way to Valley Grassy Forest due to the higher rainfall there.

Tree Canopy: A pure stand of *Eucalyptus camaldulensis*.

Lower trees: *Acacia mearnsii* is very common. *A. melanoxylon* and *A. implexa* may also be present. *Exocarpos cupressiformis* is occasionally present, as near the Alamein train station.

Shrubs: Usually sparse, but sometimes becoming dense with wattles and *Cassinia* species following soil disturbance.

Vines: Indigenous vines are naturally very sparse or absent.

Ferns: Usually absent.

Ground flora: Densely grassy and rich in herbs (particularly lilies). *Themeda triandra* is the most common dominant, usually with various wallaby-grasses (e.g. *Austrodanthonia racemosa*) and spear-grasses (e.g. *Austrostipa rudis* subsp. *rudis*). Species that are indicative of this EVC in Boroondara (but not always present) include *Convolvulus erubescens* (= *C. angustissimus*), *Chloris truncata*, *Panicum effusum* and *Stipa scabra*.

Conservation Status: This is the best-conserved EVC in Boroondara, with moderately intact stands at several locations such as Beckett Park, Markham Reserve and the railway reserve between Alamein and Hartwell stations. The EVC was once very widespread outside Boroondara, but has been decimated. The Department of Sustainability & Environment lists it as 'endangered' in the Gippsland Plain bioregion.

EVC 56 – Floodplain Riparian Woodland

Quick recognition: Identifiable as a woodland of *Eucalyptus camaldulensis* (or in some of Victoria, *Eucalyptus viminalis*) that extends many tens, or even hundreds, of metres from a perennial streams. Unlike Riparian Forest (EVC 18), *Melicytus dentatus* is abundant and *Pomaderris aspera* is scarce or absent. *Rapanea howittiana* is not always present, but it is rarely found outside this EVC. Wetlands within this EVC are usually classified as EVC 172 – Floodplain Wetland Complex.

Position in the Boroondara landscape: Currently confined to the broadest areas of the Yarra River's floodplain. Riparian Forest occurs in narrower valleys whose floodwaters drain more rapidly.

Tree canopy: Rather open to moderately dense, dominated by *Eucalyptus camaldulensis*, sometimes with *Eucalyptus viminalis* and/or *E. ovata*.

Lower trees: *Acacia dealbata* and *A. melanoxylon* are usually present, sometimes also with *A. mearnsii*. Apparently not reaching as tall as in Riparian Forest. *Rapanea howittiana* is present in more intact stands.

Shrubs: *Melicytus dentatus* and often *Melaleuca ericifolia* are abundant. *Ozothamnus ferrugineus*, *Bursaria spinosa* and *Gynatrix pulchella* may also be rather abundant in more intact stands. *Senecio minimus* may be abundant. *Callistemon sieberi* is usually present at the edge of the river running through this EVC, and is a characteristic species of this EVC.

Vines: Indigenous vines may be sparse or absent, but bindweeds of mixed indigenous/introduced origin (from the *Calystegia sepium/silvatica* complex) can be extremely dense following floods. Introduced vines such as Japanese Honeysuckle, Cruel Vine and Blackberry often invade and may become abundant.

Ferns: No longer present in Boroondara, but elsewhere, *Blechnum minus* can be fairly abundant and *Cyathea australis* is sometimes present in small numbers.

Ground flora: Highly degraded in Boroondara by past agriculture, overrun by pasture grasses (e.g. *Phalaris aquatica* and *Pennisetum clandestinum*) and pastoral weeds. *Carex appressa*, *Poa ensiformis*, *Poa labillardierei*, *Phragmites australis* and *Lycopus australis* are characteristic. *Persicaria* species are fairly abundant in Boroondara, as elsewhere.

Conservation Status: Floodplain Riparian Woodland is regarded by the Department of Sustainability & Environment as 'endangered' in the Gippsland Plain bioregion.

EVC 74 – Wetland Formation

This EVC is best regarded as a collection of EVCs, and it applies to any freshwater water body or seasonally inundated area that has native vegetation. It includes within it Floodplain Wetland Complex (EVC 172) and Aquatic Herbland (EVC 653), each of which has been separately identified in this study where possible. Wetlands often occur within swampy or riparian EVCs (e.g. Riparian Forest or Swampy Riparian Woodland) and they can be either classified as EVC 74 or deemed part of the surrounding EVC.

Water bodies with negligible or no known vegetation are classified as EVC 998 (Water Body – natural or man-made) rather than EVC 74. Only the most barren water body fits this description, taking into account that

underwater plants are usually difficult to detect. Vegetation that is submerged and invisible may be important habitat for invertebrates, fish and birds that dabble or dive.

Position in the landscape: Natural and manmade occurrences are scattered along Boroondara's stream corridors, but usually modified by past grazing, drainage, changed hydrology and removal of the surrounding woodland. There are also dams scattered on more elevated ground, which often become vegetated once wind and waterbirds introduce seeds and plant fragments.

Conservation Status: The vegetation of all wetland communities (including EVCs 74, 172 and 653) is regarded by the Department of Sustainability & Environment as 'endangered' in the Gippsland Plain bioregion.

EVC 68 – Creekline Grassy Woodland

Quick recognition: Drainage lines with *Eucalyptus ovata* in the canopy, flanked by *Eucalyptus camaldulensis* on the adjacent slopes.

Position in the landscape: In strips measuring several tens of metres wide along gullies with non-perennial creeks, flanked by Plains Grassy Woodland (EVC 55), where annual average rainfall is below approximately 700 mm.

Tree Canopy: Includes *Eucalyptus ovata*, accompanied to varying degrees by *Eucalyptus camaldulensis* (which dominates the adjacent slopes).

Lower trees: *Acacia mearnsii* and *Acacia melanoxylon* are usual, sometimes with *Melaleuca ericifolia* (which has been totally removed from occurrences of this EVC in Boroondara).

Shrubs: There are no indigenous shrubs left in Boroondara's stands of this EVC, but *Bursaria spinosa* occurs in other stands.

Ferns: Usually absent or represented only by *Pteridium esculentum*.

Ground flora: Densely grassy and not particularly rich in herbs, even in intact stands. In Boroondara, all that remains of the indigenous ground flora in this EVC are the common grass, *Austrodanthonia racemosa*, and the common species of wet ground, *Juncus amabilis*, *Persicaria decipiens*, *Phragmites australis*, *Juncus bufonius*, *Juncus pallidus*, *Epilobium hirtigerum* and *Lythrum hyssopifolia*.

Conservation Status: Creekline Grassy Woodland is extremely poorly conserved in Boroondara, being represented only by a handful of heavily degraded examples. The Department of Sustainability & Environment lists it as 'endangered' in the Gippsland Plain bioregion.

EVC 164 – Creekline Herb-rich Woodland

Quick recognition: Not possible in Boroondara due to heavy modification of the usual structure and composition of this EVC.

Position in the landscape: In strips from several metres to several tens of metres wide along swampy gullies, flanked by Valley Grassy Forest (EVC 47), where annual average rainfall exceeds approximately 700 mm.

Tree Canopy: Usually dominated by *Eucalyptus ovata* but often accompanied by canopy species of the adjacent Valley Grassy Forest (such as *Eucalyptus melliodora* and *Eucalyptus radiata*).

Lower trees: *Acacia melanoxylon* is common outside Boroondara, but lower trees have been completely removed from Creekline Herb-rich Woodland in Boroondara.

Shrubs: Typically moderately dense (but variable) outside Boroondara; However, the only shrubs left in this EVC in Boroondara are a handful of *Bursaria spinosa* plants.

Ferns: Absent in Boroondara, but more generally quite conspicuous (unlike other EVCs in Boroondara). *Adiantum aethiopicum*, *Blechnum minus*, *Cyathea australis*, *Hypolepis rugosula*, *Polystichum proliferum* and *Pteridium esculentum* are often present in Creekline Herb-rich Woodland outside Boroondara.

Ground flora: Densely grassy and rich in herbs in intact stands, but decimated within Boroondara. Characteristic species include *Senecio minimus*, *Triglochin striatum*, *Poa tenera*, *Centella cordifolia* and *Lobelia anceps*, however only the first two of these remain in Boroondara (along with common species of creek banks).

Conservation Status: Creekline Herb-rich Woodland is all but extinct in Boroondara, being represented by only vestiges surviving within predominantly exotic vegetation and revegetation, along Back Creek near Riversdale Rd. The EVC was once moderately common along creeks to the east and northeast of Boroondara, but has been decimated. The Department of Sustainability & Environment lists it as 'endangered' in the Gippsland Plain bioregion.

EVC 172 – Floodplain Wetland Complex

Quick recognition: Seasonal or perennial wetlands on floodplains of the more major streams, with floating aquatic plants and fringed by the genera *Alisma*, *Juncus*, *Carex*, *Typha* and *Persicaria*. Aquatic Herbland (EVC 653) appears to be a narrower type of vegetation that lies within EVC 172, except that the former is not (arbitrarily?) confined to broad floodplains of larger streams.

Position in the Boroondara landscape: Billabongs, cut-off meanders and depressions on the floodplains of the Yarra River and Gardiners Creek, in association with Floodplain Riparian Woodland.

Trees: *Eucalyptus camaldulensis* may occur in areas that are only seasonally inundated; otherwise treeless.

Vines, terrestrial ferns: None.

Shrubs: *Melaleuca ericifolia* may occur at the water's edge.

Fringing plants: Members of the genera *Alisma*, *Juncus*, *Carex*, *Eleocharis*, *Typha* and *Persicaria* are abundant. *Crassula helmsii* and *Alternanthera denticulata* are often present

Aquatic plants: *Potamogeton* species, *Triglochin procera* and *Lemna disperma* are generally present. *Azolla filiculoides* is fairly common. *Landoltia* (= *Spirodela*) *punctata* and *Wolffia australiana* are sometimes present.

Conservation Status: The vegetation of all wetland communities (including EVCs 74, 172 and 653) is regarded by the Department of Sustainability & Environment as 'endangered' in the Gippsland Plain bioregion.

EVC 175 – Grassy Woodland

This EVC name has been used for a range of quite distinct communities in the Melbourne area, dominated variously by sheoaks (*Allocasuarina* species), White Sallee (*Eucalyptus pauciflora* subsp. *pauciflora*) or (in Boroondara) River Red Gum (*Eucalyptus camaldulensis*) and Yellow Box (*Eucalyptus melliodora*).

Quick recognition: Woodland with *Eucalyptus melliodora* and sometimes *Eucalyptus viminalis* subsp. *pryoriana* present, usually with *Eucalyptus camaldulensis* where Plains Grassy Woodland occurs nearby.

Position in the Boroondara landscape: On the tops of low ridges capped by Tertiary sands. The various forms of Grassy Woodland within the Melbourne area all tend to have soils comprising grey to brown sands over mottled orange, brown and grey clays.

Tree Canopy: As indicated above.

Lower trees: Similar to Plains Grassy Woodland. *Acacia melanoxylon* and *A. mearnsii* are very common. *Exocarpos cupressiformis* is occasionally present. *Allocasuarina littoralis* may have once occurred but was not found in this study.

Shrubs: Usually sparse in intact examples outside Boroondara. Within Boroondara, only *Acacia paradoxa*, *A. pycnantha*, *Cassinia aculeata*, *C. arcuata* and a solitary (perhaps transient) *Ozothamnus ferrugineus* remain.

Vines: In Boroondara, confined to a small number of individuals of *Glycine ?tabacina* in a stand that is transitional to Plains Grassy Woodland. *Billardiera scandens* and/or *Comesperma volubile* were probably once present.

Ferns: *Pteridium esculentum* may be present in general, but none was found in Boroondara.

Ground flora: Rich in species. Grasses dominate but there are usually substantial gaps between them, providing habitat for the characteristic species *Cotula australis*, *Crassula sieberiana*, *Triptilodiscus pygmaeus* and *Lomandra nana* (although *Triptilodiscus* seems to have become locally extinct in recent years). The grasses *Austrodanthonia geniculata*, *A. setacea*, *Austrostipa mollis* and *Dichelachne crinita* are typical, growing with many grass species in common with Plains Grassy Woodland.

Conservation Status: Very poorly conserved in Boroondara. Beardsell (2003) reports that there are remnants of 'partially intact' Grassy Woodland on the highest ground in Yarra Bend Park. There are others on a hilltop at Beckett Park in Balwyn and three tiny strips of rail verge in Ashburton and Canterbury. Within the whole Gippsland Plain bioregion, the Department of Sustainability & Environment lists Grassy Woodland as 'endangered'.

EVC 641 – Riparian Woodland

Quick recognition: Located beside perennial streams but not on floodplains (where the alluvium supports Floodplain Riparian Woodland instead). Tall *Acacia dealbata* trees are common, almost as tall as the dominant River Red Gums.

Position in the Boroondara landscape: Moist, lower slopes and riverbanks of the Yarra River (Wurrundjeri Spur and Studley Point) and Gardiners Creek. Inundation occurs during floods, but the water drains much quicker than on floodplains.

Tree canopy: Rather open to moderately dense, dominated by *Eucalyptus camaldulensis*, sometimes with *Eucalyptus viminalis* and/or *Eucalyptus ovata*.

Lower trees: *Acacia dealbata* is common and reaches heights comparable with the eucalypts. *Acacia mearnsii* is sometimes also present.

Shrubs: A mixture of riparian species such as *Melaleuca ericifolia*, *Melicytus dentatus*, *Gynatrix pulchella* and *Callistemon sieberi* (in decreasing order of frequency). Shrubs with lower dependence on moist soil are also present, such as *Bursaria spinosa* and *Ozothamnus ferrugineus*.

Vines: *Rubus parvifolius* is a characteristic species of this community in Boroondara. Introduced vines such as Japanese Honeysuckle and Blackberry often invade and may become abundant.

Ferns: Very scarce in Boroondara, although ferns may have once been more common.

Ground flora: *Poa labillardierei* is a characteristic species, but its numbers appear to have been decimated in Boroondara, particularly by introduced grasses such as *Cynodon dactylon*, *Pennisetum clandestinum* and *Phalaris aquatica*. The edge of the abutting stream supports typical riverine plants such as *Alternanthera denticulata* and species of *Isolepis*, *Juncus* and *Persicaria*.

Conservation Status: Very poorly conserved in Boroondara, where represented by several very narrow strips beside the Yarra River and Gardiners Creek. Within the whole Gippsland Plain bioregion, the Department of Sustainability & Environment lists Riparian Woodland as 'endangered'.

EVC 653 – Aquatic Herbland

Within Boroondara, this EVC represents part of the broader Floodplain Wetland Complex (EVC 172).

Quick recognition: Perennial or semi-perennial wetlands on floodplains of the more major streams, heavily vegetated but woody plants are absent or almost so. Look for abundant Tall Spike-sedge *Eleocharis sphacelata* and Water-ribbons *Triglochin procera*. Floating aquatics are also usually dense in season.

Position in the Boroondara landscape: In depressions within the floodplain of the Yarra River.

Conservation Status: The vegetation of all wetland communities (including EVCs 74, 172 and 653) is regarded by the Department of Sustainability & Environment as 'Endangered' in the Gippsland Plain bioregion.

EVC 895 – Escarpment Shrubland

Quick recognition: Densely shrubby, low woodland or shrubland on steep, fast-draining slopes. There are two variants (floristic communities): One has abundant *Acacia implexa* and *Bursaria spinosa* and the other has abundant *Acacia pycnantha*, *Dodonaea viscosa* and chenopods. *Myoporum* sp. 1 ('*petiolatum*') is a very strong indicator of this EVC, but may be absent in badly degraded examples.

Position in the Boroondara landscape: Steep slopes or cliffs above the Yarra River or Gardiners Creek, in Silurian sedimentary geology; not within the zone of periodic inundation.

Tree Canopy: A sparse or very sparse cover of eucalypts that are outliers from adjacent EVCs.

Lower trees: Dense wattles, particularly *Acacia implexa*, *A. pycnantha* or *Acacia mearnsii*. *Exocarpos cupressiformis* is present in more intact stands, and sometimes also *Allocasuarina verticillata*.

Shrubs: Dense. The floristic community with dense *Acacia implexa* has dense *Bursaria spinosa*, while the floristic community with dense *Acacia pycnantha* has dense *Dodonaea viscosa* and sometimes *Cassinia longifolia*. *Myoporum* sp. 1 ('*petiolatum*') can occur in either floristic community. Smaller shrubs are also present in more intact stands, e.g. *Correa glabra*, *Goodenia ovata*, *Olearia ramulosa*.

Vines: *Clematis microphylla* is abundant. *Rubus parvifolius* is also abundant near Victoria Bridge.

Ferns: *Adiantum aethiopicum* or *Asplenium flabellifolium* are present in more intact stands with sheltered aspects.

Ground flora: Very sparse to moderate, depending on rockiness and rapidity of drainage. The floristic community dominated by *Acacia implexa* has ground flora similar to Plains Grassy Woodland, whereas the other floristic community is rich in chenopods and spear-grasses. Rich in species. Grasses dominate but there are usually substantial gaps between them, providing habitat for the characteristic species *Cotula australis*, *Crassula sieberiana*, *Triptilodiscus pygmaeus* and *Lomandra nana* (although *Triptilodiscus* seems to have become locally extinct in recent years). The grasses *Austrodanthonia geniculata*, *A. setacea*, *Austrostipa mollis* and *Dichelachne crinita* are typical, growing with many grass species in common with Plains Grassy Woodland.

Conservation Status: Beardsell (2003) states that the floristic community with abundant *Acacia pycnantha* and *Dodonaea viscosa* is represented by several stands in Yarra Bend Park, one of which is 'relatively intact/extensive'. He mentions two stands of the *Acacia implexa/Bursaria spinosa* floristic community in Yarra Bend Park, one of which is 'relatively intact/small'. Outside Yarra Bend Park, Escarpment Shrubland is very poorly conserved in Boroondara, represented by tiny, badly degraded patches near Victoria Bridge and Ryburne Avenue Reserve in Ashburton, the latter being intermediate with Grassy Woodland. Within the whole Gippsland Plain bioregion, the Department of Sustainability & Environment lists Escarpment Shrubland as 'endangered'.

998 – Water Body, natural or man-made

'998' is a 'map unit number' (rather than EVC number) assigned to water bodies with no or negligible vegetation in them. Most water bodies have some vegetation, even though it may be hidden underwater (see EVC 74).

Conservation Status: The Department of Sustainability & Environment Native Vegetation Framework does not assign any conservation status rating to water bodies that are essentially unvegetated. The biological significance of any such water body depends on the support that it provides to wildlife or the indirect benefits that it may provide to indigenous flora or fauna, e.g. by discharge or percolation of water to habitat next to it or downhill.

Appendix B – Inventory of Indigenous Plant Species

The table below is an inventory of indigenous plant species that grow (or once grew) wild in Boroondara. Species are ordered alphabetically within major groupings as follows: ferns, monocotyledons, dicotyledons, mosses and liverworts. The lists for mosses and liverworts are undoubtedly incomplete because these groups have undergone little investigation.

Scientific names follow the Department of Sustainability & Environment's Flora Information System as at June 2005, which in turn follows Ross and Walsh (2003). Synonyms are given for names that have lost favour in recent years. Common names follow 'Flora of Victoria' (Walsh and Entwisle 1994, 1996, 1999) where available, defaulting to Beaglehole (1983) and then to the names used in the Flora Information System. To assist interpretation of the list as taxonomy changes, the column headed 'FIS code' gives each species' code number in the Department of Sustainability & Environment's Flora Information System (or FIS). Even as plant names change, the code numbers should not (although there have been lapses in the FIS's history).

Most species have been confirmed by the author's observations, as indicated by the initials 'GL' in the column headed 'Certified'. Nearly all the other species have either 'MEL' or 'CB' in this column, the former to indicate that there is a specimen at the National Herbarium of Victoria, and the latter for species that have been either seen by Cam Beardsell or have been checked by him during preparation of his flora inventory report for Yarra Bend Park (Beardsell 2003). The few remaining species are deemed here to be probably correct. Many records of plants in Boroondara have been omitted because they are either erroneous or have insufficient evidence to support them.

The column headed 'Last Record' indicates the year of the most recent reliable record found in this study. The older the record, the less likely that the species remains within Boroondara.

The column headed '# Sites' indicates how many of the 58 sites described in this study have been reliably reported to contain the species within the past decade. The parts of Boroondara outside the 58 sites are treated as a site for the purpose of this total. The data in this column provide a guide as to the geographic spread of each species within Boroondara.

The entries in the 'Conservation Status' columns refer to the species' conservation status at various spatial scales, as described in Section 2.4. Each 'M' in the column with the subheading 'Melb' indicates a species that is rare or threatened in greater Melbourne, but with undetermined level of threat and probably some omissions (Section 2.4). The letters in the other two conservation status columns have the following meanings:

- X Presumed extinct within the corresponding area
- C Critically Endangered
- E Endangered
- V Vulnerable
- DD Data deficient, i.e. insufficient information to make an assessment
- R Rare but facing no known threats
- S Secure but not abundant and widespread
- A Abundant and widespread
- T Transient, occasionally germinating from parents outside Boroondara (or cultivated plants) and not persisting.

FIS Code	Scientific Name	Common Name	Conserv'n Status			# Sites	In YBP?	Last Record	Certified	Foot-note
			Boroondara	Melb	Vic					

Ferns and Fern Allies

129	<i>Adiantum aethiopicum</i>	Common Maidenhair	C			1	Yes	2001	CB
288	<i>Asplenium flabellifolium</i>	Necklace Fern	C			1	Yes	2001	CB
347	<i>Azolla filiculoides</i>	Pacific Azolla	S			5	Yes	2005	GL
730	<i>Cheilanthes austrotenuifolia</i>	Green Rock Fern	C			1	Yes	1995	CB
733	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Narrow Rock Fern	C	M		1	Yes	2001	CB
895	<i>Cyathea australis</i>	Rough Tree-fern	T			1	Yes	1995	CB
1098	<i>Doodia australis</i>	Common Rasp-fern	C	M		1	Yes	2001	CB
1753	<i>Hypolepis rugosula</i>	Ruddy Ground-fern	C	M		1	Yes	2001	CB
2127	<i>Marsilea drummondii</i>	Common Nardoo	X	M		0	No	1914	
2645	<i>Polystichum proliferum</i>	Mother Shield-fern	T			1	Yes	2001	CB
2777	<i>Pteridium esculentum</i>	Austral Bracken	C			2	Yes	2004	GL
2779	<i>Pteris tremula</i>	Tender Brake	E	M		1	Yes	2002	CB

FIS Code	Scientific Name	Common Name	Conserv'n Status			# Sites	In YBP?	Last Record	Certified	Foot-note
			Boroondara	Melb	Vic					
174	<i>Alisma plantago-aquatica</i>	Water Plantain	S			5	Yes	2005	GL	
3623	<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass	X	M		0	No	1942	MEL	1
3628	<i>Amphibromus nervosus</i>	Veined Swamp Wallaby-grass	X	M		0	No	1934	MEL	
	<i>Arachnorchis</i> - see <i>Caladenia</i>									
270	<i>Arthropodium minus</i>	Small Vanilla-lily	X	M		0	Yes	1987	CB	
5126	<i>Arthropodium strictum</i>	Chocolate Lily	S			7	Yes	2005	GL	
4418	<i>Austrodanthonia bipartita</i>	Leafy Wallaby-grass	DD			1	Yes	2004	GL	2
961	<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass	DD			4	Yes	2005	GL	
962	<i>Austrodanthonia carphoides</i>	Short Wallaby-grass	C			1	No	2004	GL	
964	<i>Austrodanthonia eriantha</i>	Hill Wallaby-grass	V			4	Yes	2005	GL	
4409	<i>Austrodanthonia fulva</i>	Leafy Wallaby-grass	S			15	Yes	2005	GL	
965	<i>Austrodanthonia geniculata</i>	Kneed Wallaby-grass	V			5	Yes	2005	GL	
976	<i>Austrodanthonia induta</i>	Tall Wallaby-grass	C	M	DD	0	No	1990	GL	
	= <i>Danthonia procera</i>									
967	<i>Austrodanthonia laevis</i>	Smooth Wallaby-grass	V			7	Yes	2005	GL	
974	<i>Austrodanthonia penicillata</i>	Slender Wallaby-grass	V			5	Yes	2005	GL	
975	<i>Austrodanthonia pilosa</i>	Velvet Wallaby-grass	V			4	Yes	2005	GL	
977	<i>Austrodanthonia racemosa</i>	Clustered Wallaby-grass	A			34	Yes	2005	GL	
4379	<i>Austrodanthonia setacea</i>	Bristly Wallaby-grass	A			18	Yes	2005	GL	
981	<i>Austrodanthonia tenuior</i>	Purplish Wallaby-grass	V			5	Yes	2005	GL	
3266	<i>Austrostipa bigeniculata</i>	Kneed Spear-grass	E	M		1	Yes	2001	CB	
3267	<i>Austrostipa blackii</i>	Crested Spear-grass	C	M		0	Yes	1987	MEL	
3271	<i>Austrostipa densiflora</i>	Dense Spear-grass	C	M		1	Yes	2001	CB	
3273	<i>Austrostipa elegantissima</i>	Feather Spear-grass	E	M		1	Yes	2001	CB	
3279	<i>Austrostipa mollis</i>	a Spear-grass	S			5	Yes	2005	GL	
3280	<i>Austrostipa muelleri</i>	Wiry Spear-grass	C			1	Yes	2001	CB	
3285	<i>Austrostipa nodosa</i>	Knotty Spear-grass	C	M		0	Yes	1977	MEL	
3286	<i>Austrostipa oligostachya</i>	Fine-head Spear-grass	E	M		1	No	2004	GL	
3288	<i>Austrostipa pubinodis</i>	a spear-grass	E			2	Yes	2005	GL	
4941	<i>Austrostipa rudis</i> subsp. <i>nervosa</i>	Veined Spear-grass	E	M		1	Yes	2001	CB	
4942	<i>Austrostipa rudis</i> subsp. <i>rudis</i>	Veined Spear-grass	S			7	Yes	2005	GL	
3275	<i>Austrostipa scabra</i> subsp. <i>falcata</i>	Rough Spear-grass	V			4	Yes	2005	GL	
4943	<i>Austrostipa scabra</i> subsp. <i>scabra</i>	Rough Spear-grass	E	M		1	Yes	2001	CB	
3291	<i>Austrostipa semibarbata</i>	Fibrous Spear-grass	V			1	Yes	2001	CB	
4669	<i>Bolboschoenus fluviatilis</i>	Stream Club-rush	C	M	DD	1	Yes	2001	CB	
510	<i>Bulbine bulbosa</i>	Yellow Bulbine-lily	E			1	No	2004	GL	
512	<i>Burchardia umbellata</i>	Milkmaids	C			4	Yes	2005	GL	
519	<i>Caesia calliantha</i>	Blue Grass-lily	C			1	Yes	2004	GL	
955	<i>Caladenia carnea</i>	Pink Fingers	C			1	Yes	1995	CB	
4344	<i>Caladenia phaeoclavia</i>	Brown-clubbed Spider-orchid	X			0	No	1917	MEL	
623	<i>Carex appressa</i>	Tall Sedge	E			6	Yes	2005	GL	
627	<i>Carex breviculmis</i>	Short-stem Sedge	V			5	Yes	2004	GL	
638	<i>Carex fascicularis</i>	Tassel Sedge	T	M		1	Yes	2001	CB	
639	<i>Carex gaudichaudiana</i>	Fen Sedge	C	M		1	No	2005	GL	
642	<i>Carex inversa</i>	Knob Sedge	DD			3	No	2005	GL	3
4338	<i>Carex inversa</i> forma <i>inversa</i>	Common Sedge	V			1	Yes	2001	CB	
726	<i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>	Blue Stars	X			0	No	1989		
756	<i>Chloris truncata</i>	Windmill Grass	C			2	No	2004	GL	

¹ *Amphibromus fluitans* is listed as a vulnerable species under the *Environment Protection and Biodiversity Conservation Act 1999*, and Kew is the type locality. There is a remote chance that it persists at a billabong beside the Yarra River in Kew East or Kew.

² The status of *Austrodanthonia bipartita* in Boroondara is not yet resolved. Boroondara is outside the accepted geographical range of that taxon but many specimens collected in this study appear closer to it than to the very closely related *A. fulva*.

³ This taxon probably includes at least some non-indigenous plants.

FIS Code	Scientific Name	Common Name	Conserv'n Status			# Sites	In YBP?	Last Record	Certified	Foot-note
			Boroondara	Melb	Vic					
112	<i>Cyrtostylis reniformis</i> <i>Danthonia</i> - see <i>Austrodanthonia</i>	Small Gnat Orchid	X	M		1	Yes	1995	CB	
1023	<i>Deyeuxia quadriseta</i>	Reed Bent-grass	C			2	Yes	2005	GL	
5555	<i>Dianella admixta</i> <i>Dianella revoluta</i> : see <i>D. admixta</i>	Black-anther Flax-lily	S			4	Yes	2005	GSL	
1028	<i>Dianella longifolia</i> / <i>laevis</i>	Pale Flax-lily	DD			3	Yes	2005	GL	
5560	<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	Arching Flax-lily	E	M	V	2	Yes	2004	GL	4
1033	<i>Dichelachne crinita</i>	Long-hair Plume-grass	S			9	Yes	2005	GL	
3792	<i>Dichelachne rara/sciurea</i>	Common Plume-grass	C			1	Yes	2001	CB	
1150	<i>Dipodium punctatum</i> s.s.	Purple Hyacinth-orchid	C	M		1	Yes	1998	MEL	5
1076	<i>Distichlis distichophylla</i>	Australian Salt-grass	C			1	Yes	2001	CB	
1061	<i>Diuris behrii</i>	Golden Cowslips	X	M	V	0	No	1925	MEL	
1080	<i>Diuris pardina</i>	Leopard Orchid	X			0	No	1987		
1122	<i>Echinopogon ovatus</i>	Common Hedgehog-grass	C			1	Yes	2001	CB	
1139	<i>Eleocharis acuta</i>	Common Spike-rush	E			2	No	2005	GL	
1141	<i>Eleocharis gracilis</i>	Slender Spike-rush	E	M		1	No	2005	GL	
1146	<i>Eleocharis sphacelata</i>	Tall Spike-rush	S			4	No	2005	GL	
146	<i>Elymus scaber</i> var. <i>scaber</i>	Common Wheat-grass	S			8	Yes	2005	GL	
1159	<i>Enneapogon nigricans</i>	Nigger-heads	C	M		0	No	1992		
1185	<i>Eragrostis brownii</i>	Common Love-grass	S			3	Yes	2005	GL	
1193	<i>Eragrostis parviflora</i>	Weeping Love-grass	C	M		1	Yes	2001	CB	
1782	<i>Ficinia nodosa</i>	Knobby Club-rush	C			1	Yes	2001	CB	
1394	<i>Gahnia radula</i>	Thatch Saw-sedge	C			2	No	2005	GL	
1451	<i>Glyceria australis</i>	Australian Sweet-grass	E			3	Yes	2005	GL	
1654	<i>Hemarthria uncinata</i> var. <i>uncinata</i>	Mat Grass	E			1	Yes	2001	CB	
1756	<i>Hypoxis hygrometrica</i>	Golden Weather-glass	C			0	No	1990		
3778	<i>Hypoxis vaginata</i>	Sheath Star	C			1	Yes	2004	GL	6
1760	<i>Imperata cylindrica</i>	Blady Grass	C			1	Yes	2001	CB	
1772	<i>Isolepis cernua</i> var. <i>cernua</i>	Nodding Club-rush	S			4	No	2005	GL	7
1783	<i>Isolepis cernua</i> var. <i>platycarpa</i>	a Club-rush	V			4	No	2005	GL	7
1777	<i>Isolepis hookeriana</i>	Grassy Club-rush	V			3	No	2004	GL	
1779	<i>Isolepis inundata</i>	Swamp Club-rush	V			5	Yes	2005	GL	
1780	<i>Isolepis marginata</i>	Little Club-rush	V			4	Yes	2004	GL	
1803	<i>Juncus amabilis</i>	Hollow Rush	S			16	Yes	2005	GL	
1808	<i>Juncus australis</i>	Austral Rush	C	M		2	No	2005	GL	
1810	<i>Juncus bufonius</i>	Toad Rush	A			12	Yes	2005	GL	
1820	<i>Juncus gregiflorus</i>	Green Rush	S			12	Yes	2005	GL	
1821	<i>Juncus holoschoenus</i>	Joint-leaf Rush	E			1	Yes	2001	CB	
1830	<i>Juncus pallidus</i>	Pale Rush	V			6	Yes	2005	GL	
1831	<i>Juncus pauciflorus</i>	Loose-flower Rush	V			6	Yes	2005	GL	
1841	<i>Juncus sarophorus</i>	Broom Rush	S			8	No	2005	GL	
1843	<i>Juncus subsecundus</i>	Finger Rush	V			12	Yes	2005	GL	
1845	<i>Juncus usitatus</i>	Rush	V	M		9	Yes	2005	GL	
4205	<i>Lachnagrostis aemula</i>	Purplish Blown Grass	V	R		1	Yes	2001	CB	
151	<i>Lachnagrostis filiformis</i>	Common Blown Grass	A			17	Yes	2005	GL	
3224	<i>Landoltia punctata</i>	Thin Duckweed	V	M		1	No	2004	GL	
1893	<i>Lemna disperma</i>	Common Duckweed	S			8	No	2005	GL	
1917	<i>Lepidosperma concavum</i>	Sand-hill Sword-sedge	C			0	Yes	1883	MEL	
1925	<i>Lepidosperma ?curtisiae</i>	Little Sword-sedge	C			1	Yes	2001	CB	8
4699	<i>Lepidosperma gunnii</i>	Slender Sword-sedge	C			2	Yes	2005	GL	

⁴ Some specimens recorded as *Dianella longifolia* may well belong to this taxon.

⁵ *Dipodium punctatum* was determined by Dale Tonkinson at the Port Phillip and Westernport Catchment Management Authority in 2003 to be vulnerable within the Port Phillip and Westernport region.

⁶ It is quite possible that all records of *H. glabella* from Boroondara are referable to *H. vaginata*, which the author observed.

⁷ *Isolepis cernua* is represented in Boroondara by both varieties as well as many intermediates.

⁸ The solitary specimen referred to this taxon by Cam Beardsell may match the specimen identified as *L. concavum* at MEL.

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			Boroondara	Melb	Vic					
1923	<i>Lepidosperma laterale</i>	Variable Sword-sedge	E			1	Yes	2001	CB	
4709	<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	Wattle Mat-rush	A			10	Yes	2005	GL	
4710	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	Wattle Mat-rush	E			3	Yes	2004	GL	
2046	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	E			5	Yes	2005	GL	
3843	<i>Lomandra nana</i>	Dwarf Mat-rush	C	M		1	No	2005	GL	
	<i>Luzula meridionalis</i>	Common Woodrush								9
2069	var. <i>densiflora</i>		E			2	Yes	2004	GL	
2070	var. <i>flaccida</i>	"	E			1	Yes	2001	CB	
2071	var. <i>meridionalis</i>	"	C			1	Yes	1995	MEL	
2087	<i>Lyperanthus suaveolens</i>	Brown-beaks	X			0	No	1884	MEL	
2179	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass	A			30	Yes	2005	GL	
2187	<i>Microtis parviflora</i>	Slender Onion-orchid	V			4	Yes	2005	GL	
2189	<i>Microtis unifolia</i>	Common Onion-orchid	E			1	Yes	2001	CB	
2375	<i>Ottelia ovalifolia</i> subsp. <i>ovalifolia</i>	Swamp Lily	C	M		0	No	1964	MEL	
2404	<i>Panicum effusum</i>	Hairy Panic	C	M		2	Yes	2004	GL	
2456	<i>Pentapogon quadrifidus</i>	Five-awned Spear-grass	C			1	Yes	1995	CB	
	<i>Petalochilus</i> - see <i>Caladenia</i>									
2497	<i>Phragmites australis</i>	Common Reed	V			19	Yes	2005	GL	
2590	<i>Poa ensiformis</i>	Purple-sheathed Tussock-grass	V			1	Yes	2001	CB	
2600	<i>Poa labillardierei</i>	Common Tussock-grass	V			3	Yes	2005	GL	
2602	<i>Poa morrisii</i>	Soft Tussock-grass	V			5	Yes	2005	GL	
2609	<i>Poa ?rodwayi</i>	Velvet Tussock-grass	DD	M		1	Yes	2001	CB	
4835	<i>Poa sieberiana</i> var. <i>sieberiana</i>	Grey Tussock-grass	S			1	Yes	2001	CB	
2688	<i>Potamogeton crispus</i>	Curly Pondweed	E	M		1	No	2004	GL	
2690	<i>Potamogeton ochreatus</i>	Blunt Pondweed	C			1	No	2004	GL	
2789	<i>Pterostylis concinna</i>	Trim Greenhood	E			1	Yes	2001	CB	
4131	<i>Pterostylis melagramma</i>	Tall Greenhood	C			1	Yes	2001	CB	
2806	<i>Pterostylis nutans</i>	Nodding Greenhood	X			0	No	1989		
2810	<i>Pterostylis pedunculata</i>	Maroon-hood	C			1	Yes	2001	CB	
3038	<i>Schoenoplectus tabernaemontani</i>	River Club-rush	C	M		2	Yes	2005	GL	
	<i>Schoenoplectus validus</i> = <i>S. tabernaemontani</i>									
3039	<i>Schoenus apogon</i>	Common Bog-rush	V			7	No	2005	GL	
	<i>Spirodela</i> – see <i>Landoltia</i>									
	<i>Stipa</i> – see <i>Austrostipa</i>									
5355	<i>Thelymitra arenaria</i>	Forest Sun-orchid	C			1	No	2005	GL	
3364	<i>Thelymitra carnea</i>	Salmon Sun-orchid	X	M		0	No	1900	MEL	
5013	<i>Thelymitra pauciflora</i> s.s.	Slender Sun-orchid	C			1	Yes	2001	CB	
3384	<i>Thelymitra rubra</i>	Salmon Sun-orchid	C	M		1	Yes	2001	CB	
5914	<i>Thelymitra peniculata</i>	Trim Sun-orchid	E			4	Yes	2005	GL	
5916	<i>Thelymitra brevifolia</i>	Peppertop Sun-orchid	E			1	Yes	2001	CB	
3387	<i>Themeda triandra</i>	Kangaroo Grass	S			13	Yes	2005	GL	
3421	<i>Tricoryne elatior</i>	Yellow Rush-lily	S			11	Yes	2005	GL	
4073	<i>Triglochin procera</i>	Water-ribbons	S			8	No	2005	GL	
5513	<i>Triglochin striatum</i> (flat leaves)	Streaked Arrowgrass	C			1	No	2004	GL	
3468	<i>Typha domingensis</i>	Cumbungi	V			7	No	2005	GL	
3470	<i>Typha orientalis</i>	Cumbungi	E			1	No	2005	GL	
3578	<i>Wolffia australiana</i>	Tiny Duckweed	S	M		6	No	2005	GL	
4082	<i>Wurmbea dioica</i> subsp. <i>dioica</i>	Common Early Nancy	C			2	Yes	2004	GL	
3588	<i>Xanthorrhoea minor</i> subsp. <i>lutea</i>	Small Grass-tree	C			1	No	2005	GL	
Dicotyledons										
7	<i>Acacia acinacea</i>	Gold-dust Wattle	E			2	Yes	2005	GL	
25	<i>Acacia dealbata</i>	Silver Wattle	A			14	Yes	2005	GL	
45	<i>Acacia implexa</i>	Lightwood	S			11	Yes	2005	GL	
56	<i>Acacia mearnsii</i>	Black Wattle	A			18	Yes	2005	GL	

⁹ *Luzula meridionalis* is often not identified to varietal level, so the numbers of localities for each variety may be understated.

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			Boroondara	Melb	Vic					
57	<i>Acacia melanoxylon</i>	Blackwood	A			15	Yes	2005	GL	
61	<i>Acacia montana</i>	Mallee Wattle	C	C		1	Yes	2001	CB	
72	<i>Acacia paradoxa</i>	Hedge Wattle	S			3	Yes	2005	GL	
78	<i>Acacia pycnantha</i>	Golden Wattle	V			4	Yes	2005	GL	
104	<i>Acaena agnipila</i> (including var. <i>agnipila</i> and var. <i>tenuispica</i>)	Hairy Sheep's Burr	V			5	Yes	2004	GL	10
106	<i>Acaena echinata</i>	Sheep's Burr	DD			1	Yes	2001	CB	
105	<i>Acaena novae-zelandiae</i>	Bidgee-widgee	V			5	Yes	2005	GL	
5159	<i>Acaena ovina</i> var. <i>velutina</i>	Australian Sheep's Burr	V			0	Yes	1977	MEL	10
677	<i>Allocasuarina littoralis</i>	Black Sheoak	E			1	Yes	2001	CB	
685	<i>Allocasuarina verticillata</i>	Drooping Sheoak	E			2	Yes	2005	GL	
5097	<i>Alternanthera denticulata</i>	Lesser Joyweed	S			11	Yes	2005	GL	
218	<i>Amyema miquelii</i>	Box Mistletoe	C	M		1	Yes	2001	CB	
220	<i>Amyema pendula</i>	Drooping Mistletoe	C			0	Yes	1987		
222	<i>Amyema quandang</i> var. <i>quandang</i>	Grey Mistletoe	V			9	Yes	2005	GL	
278	<i>Asperula conferta</i>	Common Woodruff	E			2	Yes	2004	GL	
284	<i>Asperula scoparia</i>	Prickly Woodruff	C			1	Yes	2001	CB	
304	<i>Astroloma humifusum</i>	Cranberry Heath	X			0	No	1990		
332	<i>Atriplex semibaccata</i>	Berry Saltbush	E			4	Yes	2004	GL	
440	<i>Bossiaea prostrata</i>	Creeping Bossiaea	E			4	Yes	2005	GL	
470	<i>Brachyscome perpusilla</i>	Rayless Daisy	C	M		0	Yes	1987	CB	11
515	<i>Bursaria spinosa</i>	Sweet Bursaria	S			14	Yes	2005	GL	
551	<i>Calandrinia calyptrata</i>	Pink Purslane	C	M		1	Yes	2001	CB	
554	<i>Calandrinia eremaea</i>	Small Purslane	C	M		1	Yes	2001	CB	
565	<i>Callistemon sieberi</i>	River Bottlebrush	E			10	Yes	2005	GL	
573	<i>Callitriche sonderi</i>	Matted Water Starwort	E	M		2	No	2005	GL	
603	<i>Calystegia marginata</i>	Forest Bindweed	C	M		2	Yes	2005	GL	
604	<i>Calystegia sepium</i>	Large Bindweed	DD	M		6	Yes	2005	GL	12
656	<i>Carpobrotus modestus</i>	Inland Pigface	C	M		1	Yes	2001	CB	
666	<i>Cassinia aculeata</i>	Common Cassinia	C			2	Yes	2005	GL	
667	<i>Cassinia arcuata</i>	Drooping Cassinia	S			6	Yes	2005	GL	
668	<i>Cassinia longifolia</i>	Shiny Cassinia	C			1	Yes	2001	CB	
672	<i>Cassytha melanantha</i>	Coarse Dodder-laurel	C			1	Yes	2001	CB	
706	<i>Centella cordifolia</i>	Centella	C			1	No	1998		
5614	<i>Centipeda ?elatinooides</i>	Elatine Sneezeweed	C	M		1	No	1998		
748	<i>Chenopodium pumilio</i>	Clammy Goosefoot	E			1	Yes	2001	CB	
1628	<i>Chrysocephalum semipapposum</i>	Clustered Everlasting	C	M		1	Yes	2001	CB	
790	<i>Clematis microphylla</i>	Small-leaved Clematis	DD			3	Yes	2005	GL	
5884	<i>Convolvulus angustissimus</i>	Pink Bindweed	E			4	Yes	2004	GL	
822	<i>Coprosma quadrifida</i>	Prickly Currant-bush	S			7	Yes	2005	GL	
830	<i>Correa glabra</i> var. <i>glabra</i>	Rock Correa	C			1	Yes	2001	CB	
846	<i>Cotula australis</i>	Common Cotula	S			12	Yes	2005	GL	
5993	<i>Crassula colligata</i> subsp. <i>colligata</i>	a Crassula	DD			0	Yes	2001	MEL	
860	<i>Crassula decumbens</i>	Spreading Crassula	S			7	Yes	2005	GL	
862	<i>Crassula helmsii</i>	Swamp Crassula	V			4	Yes	2005	GL	
866	<i>Crassula sieberiana</i> s.l.	Sieber Crassula	S			4	Yes	2005	GL	13
903	<i>Cymbonotus preissianus</i>	Austral Bear's-ears	C			1	Yes	2001	CB	

¹⁰ The *Acaena echinata/ovina* group is represented in Boroondara mostly, if not entirely, by individuals that combine characteristics of both species, and classification into varieties is fraught with uncertainty. Specimens at the National Herbarium of Victoria have been identified as indicated above, but they do not match well with published descriptions of those taxa.

¹¹ *Brachyscome perpusilla* was determined by Dale Tonkinson at the Port Phillip and Westernport Catchment Management Authority in 2003 to be vulnerable within the Port Phillip and Westernport region.

¹² *Calystegia sepium* was observed in Boroondara as both the true species and as various hybrids with the introduced *C. silvatica*. The proportion of these records that are pure *C. sepium* is probably low.

¹³ *Crassula sieberiana* was split into three Victorian species in 2002. The records here include some referable to the new, narrower concept of *C. sieberiana*, but some others are likely to be referable to *C. colligata*.

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			Boroondara	Melb	Vic					
910	<i>Cynoglossum suaveolens</i>	Sweet Hound's-tongue	C			1	Yes	2001	CB	
1000	<i>Daviesia leptophylla</i>	Narrow-leaf Bitter-pea	C			1	Yes	2001	CB	
1008	<i>Desmodium gunnii</i>	Southern Tick-trefoil	C			1	Yes	2001	CB	
1036	<i>Dichondra repens</i>	Kidney-weed	S			7	Yes	2005	GL	
1050	<i>Dillwynia cinerascens</i>	Grey Parrot-pea	C			1	No	2004	GL	
1073	<i>Disphyma crassifolium</i> subsp. <i>clavellatum</i>	Rounded Noon-flower	V	M		1	Yes	2001	CB	
1089	<i>Dodonaea viscosa</i> subsp. <i>cuneata</i>	Wedge-leaf Hop-bush	V			1	Yes	2001	CB	
1102	<i>Drosera peltata</i> subsp. <i>auriculata</i>	Tall Sundew	X			0	No	1898		
1107	<i>Drosera peltata</i> subsp. <i>peltata</i>	Pale Sundew	E			4	Yes	2005	GL	
1110	<i>Drosera whittakeri</i> subsp. <i>aberrans</i>	Scented Sundew	X			0	No	1907		
1132	<i>Einadia hastata</i>	Saloop Saltbush	S			1	Yes	2001	CB	
1133	<i>Einadia nutans</i> subsp. <i>nutans</i>	Nodding Saltbush	S			9	Yes	2005	GL	
1134	<i>Einadia trigonos</i> subsp. <i>trigonos</i>	Hill Saltbush	E	M		1	Yes	2001	CB	
1138	<i>Elatine gratioloides</i>	Waterwort	V	M		4	Yes	2005	GL	
1156	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>	Ruby Saltbush	E			1	Yes	2001	CB	
4478	<i>Epacris impressa</i> var. <i>impressa</i>	Common Heath	C			1	Yes	1995	CB	
4445	<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>	Variable Willow-herb	S			7	Yes	2005	GL	
1179	<i>Epilobium hirtigerum</i>	Hairy Willow-herb	S			17	Yes	2005	GL	
1258	<i>Eucalyptus camaldulensis</i>	River Red Gum	A			50	Yes	2005	GL	
1283	<i>Eucalyptus globulus</i> subsp. <i>bicostata</i>	Eurabbie	C	M		1	Yes	2001	CB	
3732	<i>Eucalyptus goniocalyx</i>	Bundy, Long-leaf Box	C			1	No	2004	GL	
4484	<i>Eucalyptus leucoxylon</i> subsp. <i>connata</i>	Yellow Gum	V	M	V	3	Yes	2005	GL	
1294	<i>Eucalyptus macrorhyncha</i>	Red Stringybark	X			1	No	2004	GL	
1297	<i>Eucalyptus melliodora</i>	Yellow Box	V			15	Yes	2005	GL	
1304	<i>Eucalyptus obliqua</i>	Messmate Stringybark	C			1	No	2005	GL	
1307	<i>Eucalyptus ovata</i>	Swamp Gum	E			7	Yes	2005	GL	
3828	<i>Eucalyptus radiata</i>	Narrow-leaf Peppermint	C			1	No	2004	GL	
4487	<i>Eucalyptus viminalis</i> ssp. <i>pryoriana</i>	Coast Manna Gum	C	M		3	Yes	2005	GL	
4463	<i>Eucalyptus viminalis</i> ssp. <i>viminalis</i>	Manna Gum	C			3	Yes	2005	GL	
5209	<i>Eucalyptus</i> × <i>studleyensis</i>	Studley Park Gum	C	M	E	3	Yes	2005	GL	
4652	<i>Euchiton collinus</i>	Clustered/Creeping Cudweed	V			2	Yes	2004	GL	
3749	<i>Euchiton involucratus</i>	Common Cudweed	C			3	Yes	2004	GL	
1471	<i>Euchiton sphaericus</i>	Star Cudweed	E	M		1	Yes	2001	CB	
1350	<i>Exocarpos cupressiformis</i>	Cherry Ballart	C			5	Yes	2005	GL	
1353	<i>Exocarpos strictus</i>	Pale-fruit Ballart	C			1	Yes	2001	CB	
1409	<i>Galium gaudichaudii</i>	Rough Bedstraw	C			1	Yes	2001	CB	
5337	<i>Geranium solanderi</i> s.s.	Austral Cranesbill	C	M	V	1	No	2005	GL	
5350	<i>Geranium</i> ?sp. 14	Valley Cranesbill	C	M		1	No	2005	GL	14
5343	<i>Geranium</i> sp. 2	Variable Cranesbill	E			1	Yes	2001	CB	
5344	<i>Geranium</i> sp. 3	Pale-flowered Cranesbill	E	M	R	2	Yes	2004	GL	
5346	<i>Geranium</i> sp. 5	Naked Cranesbill	E			5	No	2005	GL	
1455	<i>Glycine clandestina</i>	Twining Glycine	E			1	Yes	2001	CB	
1456	<i>Glycine latrobeana</i>	Clover Glycine	X	M	V	0	No	1885	MEL	15
3741	<i>Glycine microphylla</i>	Small-leaf Glycine	C	M		1	Yes	2001	CB	
1457	<i>Glycine</i> ? <i>tabacina</i>	Variable Glycine	C	M		1	No	2004	GL	16
1484	<i>Gonocarpus humilis</i>	Shade Raspwort	C			1	Yes	2001	CB	
1489	<i>Gonocarpus tetragynus</i>	Common Raspwort	V			5	Yes	2005	GL	
1497	<i>Goodenia geniculata</i>	Bent Goodenia	X			0	Yes	1885	MEL	
1507	<i>Goodenia ovata</i>	Hop Goodenia	V			7	Yes	2005	GL	
1509	<i>Goodenia pinnatifida</i>	Cut-leaf Goodenia	C	M		1	Yes	1995	CB	

¹⁴ *Geranium* sp. 14 from the Freeway Golf Course was identified with 85% confidence by *Geranium* expert, Lynlee P. Smith.

¹⁵ *Glycine latrobeana* is listed as a vulnerable species under the *Environment Protection and Biodiversity Conservation Act 1999*.

¹⁶ *Glycine tabacina* from Beckett Park was identified with moderate confidence by Dr Lorimer and John Reid at the National Herbarium of Victoria. Stems were not observed to produce roots at any nodes.

FIS Code	Scientific Name	Common Name	Conserv'n Status			# Sites	In YBP?	Last Record	Certified	Foot-note
			Boroondara	Melb	Vic					
3853	<i>Gynatrix pulchella</i>	Hemp Bush	E			5	Yes	2005	GL	
1584	<i>Haloragis heterophylla</i>	Varied Raspwort	C			3	Yes	2005	GL	
1596	<i>Hardenbergia violacea</i>	Purple Coral-pea	C			2	Yes	2004	GL	
1718	<i>Hydrocotyle callicarpa</i>	Small Pennywort	X			0	Yes	1987	CB	
1720	<i>Hydrocotyle foveolata</i>	Yellow Pennywort	X			0	Yes	1887	MEL	
1723	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	C			1	Yes	2001	CB	
1730	<i>Hydrocotyle verticillata</i>	Shield Pennywort	C	M		1	Yes	2003	CB	
	<i>Hymenanthera</i> – see <i>Melicytus</i>									
1741	<i>Hypericum gramineum</i>	Small St John's Wort	E			2	Yes	2002	CB	
1743	<i>Hypericum japonicum</i>	Matted St John's Wort	X	M		0	Yes	1883	MEL	
1761	<i>Indigofera australis</i>	Austral Indigo	C			1	Yes	2001	CB	
1847	<i>Kennedia prostrata</i>	Running Postman	C			2	Yes	2005	GL	
1856	<i>Kunzea ericoides</i> sp. agg.	Burgan	C			3	Yes	2004	GL	
1908	<i>Lepidium pseudohyssopifolium</i>	Pepper-cress	E	M	DD	5	No	2005	GL	
1910	<i>Lepidium pseudotasmanicum</i>	Shade Pepper-cress	E			1	Yes	2001	CB	
1946	<i>Leptorhynchos squamatus</i>	Scaly Buttons	C			2	No	1994	GL	
1947	<i>Leptorhynchos tenuifolius</i>	Wiry Buttons	C			2	No	2005	GL	
1958	<i>Leptospermum lanigerum</i>	Woolly Tea-tree	C			1	Yes	2001	CB	
1964	<i>Leptospermum obovatum</i>	River Tea-tree	C	M		2	Yes	2001	CB	
2017	<i>Linum marginale</i>	Native Flax	E			1	Yes	2001	CB	
2021	<i>Lissanthe strigosa</i> subsp. <i>subulata</i>	Peach Heath	C	M		1	Yes	2001	CB	
2024	<i>Lobelia anceps</i>	Angled Lobelia	E			1	Yes	1995	CB	
2730	<i>Lobelia pedunculata</i>	Matted Patria	C			1	No	2004	GL	
2085	<i>Lycopus australis</i>	Australian Gipsywort	C	M		2	Yes	2001	CB	
2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife	S			8	Yes	2005	GL	
2101	<i>Maireana enchylaenoides</i>	Wingless Bluebush	V	M		1	Yes	2001	CB	
2147	<i>Melaleuca ericifolia</i>	Swamp Paperbark	S			12	Yes	2005	GL	
4933	<i>Melicytus dentatus</i>	Tree Violet	S			9	Yes	2005	GL	
2165	<i>Mentha australis</i>	River Mint	C			1	Yes	2001	CB	
2225	<i>Muehlenbeckia adpressa</i>	Climbing Lignum	X	M		1	Yes	1995	CB	
2233	<i>Muellerina eucalyptoides</i>	Creeping Mistletoe	A			28	Yes	2005	GL	
2239	<i>Myoporum insulare</i>	Common Boobialla	C	M		1	Yes	2001	CB	
2243	<i>Myoporum</i> sp. 1 (' <i>petiolatum</i> ')	Sticky Boobialla	E	M		2	Yes	2005	GL	
2253	<i>Myriophyllum caput-medusae</i>	Coarse Milfoil	X	M		0	Yes	1884	MEL	
3867	<i>Myriophyllum crispatum</i>	Upright Milfoil	E	M		2	No	2005	GL	
2221	<i>Neopaxia australasica</i>	White Purslane	C	M		1	No	2005	GL	
2275	<i>Nicotiana suaveolens</i>	Austral Tobacco	E	M	R	1	Yes	2001	CB	
2312	<i>Olearia lirata</i>	Snowy Daisy-bush	X			0	Yes	1884	MEL	
4785	<i>Olearia ramulosa</i> var. <i>ramulosa</i>	Twiggy Daisy-bush	V			1	Yes	2001	CB	
2341	<i>Opercularia ovata</i>	Broad-leaf Stinkweed	C			2	Yes	2005	GL	
2344	<i>Opercularia varia</i>	Variable Stinkweed	C			2	Yes	2005	GL	
7311	<i>Oxalis exilis/perennans</i>	Wood-sorrel	S			24	Yes	2005	GL	17
1616	<i>Ozothamnus ferrugineus</i>	Tree Everlasting	C			2	Yes	2005	GL	
1620	<i>Ozothamnus obcordatus</i>	Grey Everlasting	X	M		1	Yes	2001	CB	
2442	<i>Pelargonium australe</i>	Austral Stork's-bill	E			1	Yes	2001	CB	
2446	<i>Pelargonium inodorum</i>	Kopata	C			0	Yes	1987	CB	
3919	<i>Persicaria decipiens</i>	Slender Knotweed	A			18	Yes	2005	GL	
2628	<i>Persicaria hydropiper</i>	Water-pepper	S			8	Yes	2005	GL	
2630	<i>Persicaria lapathifolia</i>	Pale Knotweed	S			11	Yes	2005	GL	
3938	<i>Persicaria praetermissa</i>	Spotted Knotweed	V	M		4	Yes	2005	GL	
2635	<i>Persicaria prostrata</i>	Creeping Knotweed	V	M		7	Yes	2005	GL	
2637	<i>Persicaria subsessilis</i>	Hairy Knotweed	S	M		8	Yes	2005	GL	
4832	<i>Pimelea curviflora</i>	Curved Rice-flower	C			4	Yes	2005	GL	
2523	<i>Pimelea humilis</i>	Common Rice-flower	C			4	Yes	2005	GL	
2566	<i>Plantago varia</i>	Variable Plantain	C			1	Yes	2001	CB	
2569	<i>Platylobium obtusangulum</i>	Common Flat-pea	C			1	Yes	2001	CB	

¹⁷ The *Oxalis exilis/perennans* group is represented in Boroondara by individuals across the whole spectrum of variability.

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			Boroondara	Melb	Vic					
2572	<i>Platysace heterophylla</i>	Slender Platysace	X	M		0	Yes	1987	CB	
2650	<i>Pomaderris aspera</i>	Hazel Pomaderris	C			1	Yes	2001	CB	
2671	<i>Pomaderris racemosa</i>	Cluster Pomaderris	C	M		1	Yes	2001	CB	
2683	<i>Poranthera microphylla</i>	Small Poranthera	V			1	Yes	2001	CB	
2762	<i>Pseudognaphalium luteoalbum</i>	Jersey cudweed	E			7	Yes	2005	GL	
2916	<i>Rapanea howittiana</i>	Muttonwood	C	M		3	Yes	2005	GL	
2927	<i>Rhagodia candolleana</i>	Seaberry Saltbush	C	M		1	Yes	2001	CB	
2946	<i>Rorippa laciniata</i>	Jagged Bitter-cress	X			0	Yes	1885	MEL	
2956	<i>Rubus parvifolius</i>	Small-leaf Bramble	C			4	Yes	2005	GL	
2967	<i>Rumex bidens</i>	Mud Dock	C	M		3	Yes	2004	CB	
2968	<i>Rumex brownii</i>	Slender Dock	C			1	No	2005	GL	
2999	<i>Sambucus gaudichaudiana</i>	White Elderberry	C	M		1	Yes	1995	CB	
4955	<i>Sclerolaena muricata</i> var. <i>villosa</i>	Five-spined Bassia	T			1	Yes	2001	CB	
4958	<i>Senecio bathurstianus</i>	Rough Fireweed	C	M		1	Yes	2001	CB	
3102	<i>Senecio biserratus</i>	Jagged Fireweed	C			1	Yes	2001	CB	
3107	<i>Senecio glomeratus</i>	Annual Fireweed	E			3	Yes	2005	GL	
4959	<i>Senecio hispidulus</i>	Rough Fireweed	S			6	Yes	2005	GL	
3119	<i>Senecio minimus</i>	Shrubby Fireweed	E			3	Yes	2005	GL	
3120	<i>Senecio ?odoratus</i>	Scented Groundsel	T			1	Yes	2004		
3126	<i>Senecio prenanthoides</i>	Groundsel	DD			1	Yes	2001	CB	
3124	<i>Senecio quadridentatus</i>	Cotton Fireweed	A			12	Yes	2005	GL	
3129	<i>Senecio tenuiflorus</i> s.l.	Narrow Groundsel	E			1	Yes	2001	CB	
3149	<i>Sigesbeckia orientalis</i> subsp. <i>orientalis</i>	Indian Weed	E	M		1	Yes	2001	CB	
3169	<i>Solanum aviculare</i>	Kangaroo Apple	C			1	Yes	2001	CB	
3179	<i>Solanum laciniatum</i>	Large Kangaroo Apple	E			7	Yes	2005	GL	
3195	<i>Solenogyne dominii</i>	Solenogyne	V			5	Yes	2005	GL	
3196	<i>Solenogyne gunnii</i>	Solenogyne	E			4	Yes	2004	GL	
3235	<i>Spyridium parvifolium</i>	Australian Dusty Miller	C			1	Yes	2001	CB	
3255	<i>Stellaria pungens</i>	Prickly Starwort	E			1	Yes	2001	CB	
3344	<i>Tetragonia tetragonioides</i>	New Zealand Spinach	T	M		1	Yes	2001	CB	
3357	<i>Teucrium corymbosum</i>	Forest Germander	C	M		1	Yes	2001	CB	
1640	<i>Triptilodiscus pygmaeus</i>	Common Sunray	X	M		0	Yes	1987	CB	
3476	<i>Urtica incisa</i>	Scrub Nettle	V	M		6	Yes	2005	GL	
3506	<i>Veronica gracilis</i>	Slender Speedwell	E			4	Yes	2004	GL	
3512	<i>Veronica plebeia</i>	Trailing Speedwell	C			1	Yes	2001	CB	
5058	<i>Viola hederacea</i>	Ivy-leaf Violet	C			1	Yes	2001	CB	
5063	<i>Vittadinia cervicularis</i> var. <i>cervicularis</i>	Annual New Holland Daisy	E	M		1	Yes	2001	CB	
5065	<i>Vittadinia cuneata</i> var. <i>cuneata</i>	Fuzzy New Holland Daisy	C	M		1	Yes	2001	CB	
3541	<i>Vittadinia muelleri</i>	Narrow-leaf New Holland Daisy	X	M		0	No	1987		
4123	<i>Wahlenbergia communis</i>	Tufted Bluebell	E			1	Yes	2001	CB	
4124	<i>Wahlenbergia gracilenta</i>	Annual Bluebell	C			1	Yes	2001	CB	
3558	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell	E			2	Yes	2004	GL	
4059	<i>Wahlenbergia luteola</i>	Yellowish Bluebell	C	M		1	Yes	2001	CB	
3560	<i>Wahlenbergia multicaulis</i>	Tadgell's Bluebell	C	M		1	Yes	1995	CB	
3559	<i>Wahlenbergia stricta</i>	Tall Bluebell	C			1	Yes	2001	CB	
1633	<i>Xerochrysum viscosum</i>	Shiny Everlasting	V	M		1	Yes	2001	CB	
Mosses										
6694	<i>Barbula calycina</i>	Moss	DD			1	No	2005	GL	
6063	<i>Bartramia ithyphylla</i>	Common Apple-moss	DD			0	Yes	1945	MEL	
6077	<i>Brachythecium salebrosum</i>	Smooth-stalk Feather-moss	DD			0	No	1884	MEL	
6087	<i>Bryoerthrophyllum binnsii</i>	Moss	DD			1	No	2005	GL	
6140	<i>Campylopus introflexus</i>	Heath Star Moss	DD			1	No	2005	GL	
6154	<i>Ceratodon purpureus</i> subsp. <i>convolutus</i>	Moss	DD			0	Yes	1883	MEL	
6184	<i>Cryphaea ovalifolia</i>	Cryphaea	DD			0	No	1883	MEL	

FIS Code	Scientific Name	Common Name	Conserv'n Status			# Sites	In YBP?	Last Record	Certified	Foot-note
			Boroondara	Melb	Vic					
6247	<i>Ephemerum cristatum</i>	Moss	E	M		0	No	1884	MEL	18
6278	<i>Fissidens curvatus</i>	Moss	DD			0	No	1884	MEL	
9387	<i>Funaria</i> sp.	Moss	DD			0	Yes	1892	MEL	
6347	<i>Goniomitrium enerve</i>	Moss	DD			1	Yes	1995	MEL	
6387	<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>		DD			1	No	2004	GL	
		Common Hypnum								
6424	<i>Leptodictyum riparium</i>	Moss	DD			0	No	1883	MEL	
6426	<i>Leptodontium paradoxum</i>	Moss	DD			0	Yes	1994	MEL	
6458	<i>Macrocoma tenuis</i> = <i>Macromitrium tenue</i>	Moss	DD			2	No	2005	GL	
6519	<i>Physcomitrella patens</i> subsp. <i>readeri</i>	Moss	DD			0	No	1884	MEL	
6621	<i>Rhynchostegium tenuifolium</i>	Feather Moss	DD			1	No	2005	GL	
6348	<i>Schistidium apocarpum</i>	Moss	DD			0	No	1883	MEL	
6692	<i>Thuidiopsis furfurosa/sparsa</i>	Golden Weft-moss	DD			1	No	2005	GL	
6739	<i>Weissia controversa</i>	Moss	DD			0	No	1900	MEL	
9526	<i>Weissia sullivanii</i>	Moss	DD			0	No	1884	MEL	

Liverworts

6447	<i>Chiloscyphus semiteres</i>	Green Worms	DD			1	No	2005	GL	
9347	<i>Heteroscyphus</i> sp.	Crestwort	DD			1	No	2004	GL	
6450	<i>Lunularia cruciata</i>	Moonwort	S			7	No	2005	GL	
6650	<i>Ricciocarpos natans</i>	Ricciocarpos	V	M		3	No	2005	GL	
6677	<i>Targionia hypophylla</i>	Liverwort	DD			0	No	1896	MEL	

Possibly once indigenous, but now represented only in lawns or gardens

707	<i>Centipeda cunninghamii</i>	Common Sneezeweed				1	No	1986	MEL	
1728	<i>Hydrocotyle sibthorpioides</i>	Shining Pennywort				1	No	2004	GL	
2684	<i>Portulaca oleracea</i>	Pigweed (Common Purslane)				22	Yes	2005	GL	19

¹⁸ *Ephemerum cristatum* was determined by Dale Tonkinson at the Port Phillip and Westernport Catchment Management Authority in 2003 to be endangered within the Port Phillip and Westernport region.

¹⁹ *Portulaca oleracea* is common on nature strips and in pavement cracks as well as in somewhat native vegetation. It may or may not be indigenous to Victoria, but it was probably never truly indigenous in Boroondara.

Appendix C – Plant Species for Revegetation

The table below provides a guide to plant species that are both ecologically and horticulturally suitable for planting into indigenous vegetation or for reconstruction of natural vegetation communities. There is a column for each Ecological Vegetation Class (EVC) in Boroondara (excluding Yarra Bend Park), identified in the headings by the standard numbers and codes as follows:

47 VGF	Valley Grassy Forest	164 CHW	Creekline Herb-rich Woodland
53 SS	Swamp Scrub	172 FWC	Floodplain Wetland Complex
55 PGW	Plains Grassy Woodland	175 GW	Grassy Woodland
56 FRW	Floodplain Riparian Woodland	641 RW	Riparian Woodland
68 CGW	Creekline Grassy Woodland	653 AH	Aquatic Herbland
		895 ES	Escarpment Shrubland

Within the columns for the various EVCs, the suitability of each species for planting has been classified according to the following codes:

- 1: A species that should be present in any occurrence of the EVC, and planted if it is not already present;
- 2: A suitable species for routine planting, with no special considerations; and
- 3: A species only for special applications, e.g. if it is locally threatened and an opportunity arises to plant a viable population. Selection of such a species should be on the basis of expert consideration of the conditions in which the planting is to occur, and making allowance for the possible scarcity of plant stock.

PLANTING GUIDE – by Ecological Vegetation Class (EVC)

Scientific Name	Common Name	Ecological Vegetation Class										
		47 VGF	53 SS	55 PGW	56 FRW	68 CGW	164 CHW	172 FWC	175 GW	641 RW	653 AH	895 ES
Canopy Trees												
<i>Eucalyptus camaldulensis</i>	River Red Gum			1	1	1		3	3	1		3
<i>Eucalyptus leucoxylon</i> subsp. <i>connata</i>	Yellow Gum											3
<i>Eucalyptus melliodora</i>	Yellow Box	1		3	3	3	2		1	3		3
<i>Eucalyptus obliqua</i>	Messmate Stringybark	3										
<i>Eucalyptus ovata</i>	Swamp Gum					1	1					
<i>Eucalyptus radiata</i>	Narrow-leaf Peppermint	1					2					3
<i>Eucalyptus viminalis</i> ssp. <i>pryoriana</i>	Coast Manna Gum			3					2			
<i>Eucalyptus viminalis</i> ssp. <i>viminalis</i>	Manna Gum				2					3		
Understorey Trees												
<i>Acacia dealbata</i>	Silver Wattle				1	3	3			1		3
<i>Acacia implexa</i>	Lightwood	1										1
<i>Acacia mearnsii</i>	Black Wattle	1	3	1	3	1				3		1
<i>Acacia melanoxylon</i>	Blackwood	1	3	2	1	1	1		3	2		3
<i>Allocasuarina littoralis</i>	Black Sheoak			3								3
<i>Allocasuarina verticillata</i>	Drooping Sheoak											3
<i>Melaleuca ericifolia</i>	Swamp Paperbark		1		1			3		2		
<i>Rapanea howittiana</i>	Muttonwood				2					3		
Shrubs												
<i>Acacia acinacea</i>	Gold-dust Wattle			3					2			2
<i>Acacia paradoxa</i>	Hedge Wattle	2		2		3			1	3		2
<i>Acacia pycnantha</i>	Golden Wattle	2		2					1			2
<i>Bursaria spinosa</i>	Sweet Bursaria	1		2	3	2	2		1	2		1
<i>Callistemon sieberi</i>	River Bottlebrush				2					2		

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Scientific Name	Common Name	Ecological Vegetation Class										
		47 VGF	53 SS	55 PGW	56 FRW	68 CGW	164 CHW	172 FWC	175 GW	641 RW	653 AH	895 ES
<i>Cassinia aculeata</i>	Common Cassinia	1		3	3	3	3		2	3		2
<i>Cassinia arcuata</i>	Drooping Cassinia	2							2			2
<i>Cassinia longifolia</i>	Shiny Cassinia	2								3		3
<i>Coprosma quadrifida</i>	Prickly Currant-bush	2	1		1	2	1			2		
<i>Correa glabra</i> var. <i>glabra</i>	Rock Correa											2
<i>Daviesia leptophylla</i>	Narrow-leaf Bitter-pea	2		3								2
<i>Dillwynia cinerascens</i>	Grey Parrot-pea	2		3					3			3
<i>Dodonaea viscosa</i> subsp. <i>cuneata</i>	Wedge-leaf Hop-bush											2
<i>Epacris impressa</i>	Common Heath	2										
<i>Goodenia ovata</i>	Hop Goodenia	2	2	3	1	1	1		3	1		3
<i>Gynatrix pulchella</i>	Hemp Bush		2		1					2		
<i>Hymenanthera</i> – see <i>Melicytus</i>												
<i>Indigofera australis</i>	Austral Indigo	2							3			3
<i>Kunzea ericoides</i> spp. agg.	Burgan	1			3		1		2	2		2
<i>Leptospermum obovatum</i>	River Tea-tree				2					2		
<i>Leptospermum lanigerum</i>	Woolly Tea-tree		2		3					2		
<i>Lycopus australis</i>	Australian Gipsywort				2						3	
<i>Melicytus dentatus</i>	Tree Violet				1	2	3			1		3
<i>Myoporum insulare</i>	Common Boobiolla											3
<i>Myoporum</i> sp. 1 (' <i>petiolatum</i> ')	Sticky Boobiolla											1
<i>Olearia lirata</i>	Snowy Daisy-bush	1	2		3					2		
<i>Olearia ramulosa</i> var. <i>ramulosa</i>	Twiggy Daisy-bush											2
<i>Ozothamnus ferrugineus</i>	Tree Everlasting	2	2		1	1	1			1		
<i>Persicaria lapathifolia</i>	Pale Knotweed				2						3	
<i>Platylobium obtusangulum</i>	Common Flat-pea	2			3							
<i>Pomaderris racemosa</i>	Cluster Pomaderris				3							3
<i>Solanum aviculare</i>	Kangaroo Apple				3					3		2
<i>Solanum laciniatum</i>	Large Kangaroo Apple				3	2	3			3		2

Sub-shrubs

<i>Gonocarpus tetragynus</i>	Common Raspwort	2		2		2	2		2	2		
<i>Lepidium pseudohyssopifolium</i>	Pepper-cress				3							
<i>Senecio glomeratus</i>	Annual Fireweed	2		2	2	2	2		2	2		2
<i>Senecio hispidulus</i>	Rough Fireweed	2		2		2	2		2	2		2
<i>Senecio minimus</i>	Shrubby Fireweed		1		2	2	1			2		
<i>Senecio quadridentatus</i>	Cotton Fireweed	3		3		3	3		3	3		3
<i>Senecio tenuiflorus</i> s.l.	Narrow Groundsel	3										

Terrestrial Ferns

<i>Adiantum aethiopicum</i>	Common Maidenhair	2					2			2		3
<i>Blechnum minus</i>	Soft Water-fern						2					
<i>Cheilanthes austrotenuifolia</i>	Green Rock Fern											2
<i>Hypolepis rugosula</i>	Ruddy Ground-fern		2				2					

Grasses, Rushes, Sedges and their Relatives

<i>Amphibromus nervosus</i>	Veined Swamp Wallaby-grass							2			3	
<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass	3		3					3			3
<i>Austrodanthonia carphoides</i>	Short Wallaby-grass			3								
<i>Austrodanthonia eriantha</i>	Hill Wallaby-grass	2		3					2			
<i>Austrodanthonia fulva</i>	Leafy Wallaby-grass	2		2					2			1
<i>Austrodanthonia geniculata</i>	Knead Wallaby-grass	2		2					1			
<i>Austrodanthonia laevis</i>	Smooth Wallaby-grass	2		3		2	2		3			
<i>Austrodanthonia penicillata</i>	Slender Wallaby-grass	2		3			2		3	3		

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		47 VGF	53 SS	55 PGW	56 FRW	68 CGW	164 CHW	172 FWC	175 GW	641 RW	653 AH	895 ES
<i>Austrodanthonia pilosa</i>	Velvet Wallaby-grass	2		2		3	3		2			
<i>Austrodanthonia racemosa</i>	Clustered Wallaby-grass	1		1	2	2	2		1	2		1
<i>Austrodanthonia setacea</i>	Bristly Wallaby-grass	2		2					2	3		1
<i>Austrodanthonia tenuior</i>	Purplish Wallaby-grass	2		2					2			
<i>Austrostipa densiflora</i>	Dense Spear-grass											3
<i>Austrostipa elegantissima</i>	Feather Spear-grass											2
<i>Austrostipa mollis</i>	a Spear-grass			3					1			2
<i>Austrostipa oligostachya</i>	Fine-head Spear-grass			3								
<i>Austrostipa pubinodis</i>	a spear-grass	2		3								
<i>Austrostipa rudis</i> subsp. <i>nervosa</i>	Veined Spear-grass	3										
<i>Austrostipa rudis</i> subsp. <i>rudis</i>	Veined Spear-grass	1		2					2	3		
<i>Austrostipa scabra</i> subsp. <i>falcata</i>	Rough Spear-grass			2					2			
<i>Bolboschoenus fluviatilis</i>	Stream Club-rush				3							
<i>Carex appressa</i>	Tall Sedge		2		2			1				2
<i>Carex breviculmis</i>	Short-stem Sedge	2		2					2			
<i>Carex fascicularis</i>	Tassel Sedge		3					3				3
<i>Carex gaudichaudiana</i>	Fen Sedge		3					3				3
<i>Carex inversa</i> forma <i>inversa</i>	Common Sedge			3								
<i>Chloris truncata</i>	Windmill Grass			3								
<i>Danthonia</i> - see <i>Austrodanthonia</i>												
<i>Deyeuxia quadriseta</i>	Reed Bent-grass	2		2					2			
<i>Dichelachne crinita</i>	Long-hair Plume-grass			2					2			2
<i>Eleocharis acuta</i>	Common Spike-rush							1				1
<i>Eleocharis gracilis</i>	Slender Spike-rush							2				2
<i>Eleocharis sphacelata</i>	Tall Spike-rush							3				1
<i>Elymus scaber</i>	Common Wheat-grass	2		2					2			3
<i>Eragrostis brownii</i>	Common Love-grass	2		3		2	2		3	3		
<i>Gahnia radula</i>	Thatch Saw-sedge	3		3					3			
<i>Glyceria australis</i>	Australian Sweet-grass				2	2	2	2				3
<i>Hemarthria uncinata</i>	Mat Grass	2						2				
<i>Imperata cylindrica</i>	Blady Grass	3		3		3	3					
<i>Isolepis cernua</i>	a Club-rush		2		3	2	2	3				3
<i>Isolepis hookeriana</i>	Grassy Club-rush		3					3				
<i>Isolepis inundata</i>	Swamp Club-rush		2		2	2	2	2				2
<i>Isolepis marginata</i>	Little Club-rush			3					3			
<i>Juncus amabilis</i>	Hollow Rush		1		2			1				1
<i>Juncus gregiflorus</i>	Green Rush		2					2				2
<i>Juncus holoschoenus</i>	Joint-leaf Rush		3					3				3
<i>Juncus pallidus</i>	Pale Rush					2	2					
<i>Juncus pauciflorus</i>	Loose-flower Rush				2	3	2					
<i>Juncus sarophorus</i>	Broom Rush		2		2			1				1
<i>Juncus subsecundus</i>	Finger Rush	2		3	3	3	3	3		2	3	
<i>Juncus usitatus</i>	Rush				2							
<i>Lachnagrostis filiformis</i>	Common Blown Grass	2		2	2	2	2	3	3	2	3	3
<i>Lepidosperma gunnii</i>	Slender Sword-sedge								3			
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	Wattle Mat-rush	2		2		3	3		2			2
<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	Wattle Mat-rush	2		3		3	3		2			
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	1	3	3	1	1	1		3	1		3
<i>Lomandra nana</i>	Dwarf Mat-rush								2			
<i>Microlaena stipoides</i>	Weeping Grass	2		2	2	1	1		2	2		2
<i>Panicum effusum</i>	Hairy Panic			3								
<i>Poa ensiformis</i>	Purple-sheathed Tussock-grass				2		2			2		
<i>Poa labillardierei</i>	Common Tussock-grass				2	2	3			1		
<i>Poa morrisii</i>	Soft Tussock-grass	2		2		3	2		3	3		3

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		47 VGF	53 SS	55 PGW	56 FRW	68 CGW	164 CHW	172 FWC	175 GW	641 RW	653 AH	895 ES
<i>Schoenus apogon</i>	Common Bog-rush	3		3		3	3		3	3		3
<i>Stipa</i> – see <i>Austrostipa</i>												
<i>Themeda triandra</i>	Kangaroo Grass	1		1		2	3		1	2		2
<i>Xanthorrhoea minor</i>	Small Grass-tree	2		3					3			
Non-woody wildflowers – not creeping or sprawling												
<i>Arthropodium minus</i>	Small Vanilla-lily	3		3					3			
<i>Arthropodium strictum</i>	Chocolate Lily	2		2		2	2		2	2		3
<i>Bulbine bulbosa</i>	Yellow Bulbine-lily	2		2		3	3		3			2
<i>Burchardia umbellata</i>	Milkmaids	2		2		2	2		2	3		3
<i>Caesia calliantha</i>	Blue Grass-lily			3								
<i>Chamaescilla corymbosa</i>	Blue Stars								3			
<i>Chrysocephalum semipapposum</i>	Clustered Everlasting	2		2					2	2		2
<i>Cynoglossum suaveolens</i>	Sweet Hound's-tongue			3								3
<i>Dianella admixta</i>	Black-anther Flax-lily	2		2								1
<i>Dianella revoluta</i> : see <i>D. admixta</i>												
<i>Dianella longifolia</i>	Pale Flax-lily	2		2	3	2	2		3	2		3
<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	Arching Flax-lily			3					3			
<i>Drosera whittakeri</i>	Scented Sundew	3										
<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>	Variable Willow-herb			3					3			
<i>Epilobium hirtigerum</i>	Hairy Willow-herb		3	3	3	3	3			3		
<i>Hypericum gramineum</i>	Small St John's Wort	2		2		2	2		2	2		2
<i>Hypoxis vaginata</i>	Sheath Star	3		3		3	3		3			
<i>Leptorhynchos squamatus</i>	Scaly Buttons			2	3	3			2			2
<i>Leptorhynchos tenuifolius</i>	Wiry Buttons	2		2		3	3		2			
<i>Linum marginale</i>	Native Flax	2		2	2	2	2		2	2		2
<i>Lobelia anceps</i>	Angled Lobelia		1		2	2	1			3		
<i>Mentha australis</i>	River Mint				2	2						
<i>Pimelea curviflora</i>	Curved Rice-flower	2		2					2			3
<i>Pimelea humilis</i>	Common Rice-flower	2		2					2			2
<i>Poranthera microphylla</i>	Small Poranthera	2		2		2	2		2			3
<i>Thelymitra arenaria</i>	Forest Sun-orchid								3			
<i>Thelymitra peniculata</i>	Trim Sun-orchid	3		3					3			
<i>Triptilodiscus pygmaeus</i>	Common Sunray								3			
<i>Vittadinia cervicalaris</i>	Annual New Holland Daisy											3
<i>Vittadinia cuneata</i>	Fuzzy New Holland Daisy											3
<i>Vittadinia muelleri</i>	Narrow-leaf New Holland Daisy								3			
<i>Wahlenbergia communis</i>	Tufted Bluebell			2								2
<i>Wahlenbergia gracilis</i>	Sprawling Bluebell	2		2	3	3	3		2	2		2
<i>Wahlenbergia luteola</i>	Yellowish Bluebell											3
<i>Wahlenbergia multicaulis</i>	Tadgell's Bluebell	2		2					2			
<i>Wahlenbergia stricta</i>	Tall Bluebell	2										2
<i>Wurmbea dioica</i>	Common Early Nancy	3		3					3			
<i>Xerochrysum viscosum</i>	Shiny Everlasting			3					3			2
Climbers												
<i>Calystegia marginata</i>	Forest Bindweed				3							
<i>Calystegia sepium</i> (not <i>C. silvatica</i>)	Large Bindweed				3							
<i>Clematis microphylla</i>	Small-leafed Clematis											1
<i>Glycine clandestina</i>	Twining Glycine	2		3	3	3	2		3	2		
<i>Hardenbergia violacea</i>	Purple Coral-pea	1		3					2	2		2
<i>Rubus parvifolius</i>	Small-leaf Bramble	3			2	2	2			2		2

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Scientific Name	Common Name	Ecological Vegetation Class									
		47 VGF	53 SS	55 PGW	56 FRW	68 CGW	164 CHW	172 FWC	175 GW	641 RW	653 AH
Ground Covers and Sprawlers											
<i>Acaena novae-zelandiae</i>	Bidgee-widgee	2	1	3	2	2	2		2		
<i>Asperula conferta/scoparia</i>	Common Woodruff	2		3				3			
<i>Astroloma humifusum</i>	Cranberry Heath	3						3			
<i>Atriplex semibaccata</i>	Berry Saltbush			2				3			
<i>Bossiaea prostrata</i>	Creeping Bossiaea	2		2	3			2	2		3
<i>Centella cordifolia</i>	Centella		1		2	2	2		3	3	
<i>Convolvulus angustissimus</i>	Pink Bindweed			2							3
<i>Cotula australis</i>	Common Cotula	3		3				3			
<i>Crassula decumbens</i>	Spreading Crassula	3		3				3			3
<i>Crassula sieberiana</i> s.l.	Sieber Crassula							3			3
<i>Desmodium gunnii</i>	Southern Tick-trefoil					2	2				
<i>Dichondra repens</i>	Kidney-weed	1		2	2	1	1		2	2	2
<i>Einadia hastata</i>	Saloop Saltbush							3			2
<i>Einadia nutans</i> subsp. <i>nutans</i>	Nodding Saltbush	3		2	3			2	2		1
<i>Euchiton collinus</i>	Clustered/Creeping Cudweed	2		2				2			
<i>Euchiton involucratus</i>	Common Cudweed	2									
<i>Geranium solanderi</i> s.s.	Austral Cranesbill			3							
<i>Geranium</i> sp. 2	Variable Cranesbill	2		2				2			
<i>Geranium</i> sp. 3	Pale-flowered Cranesbill			3							
<i>Geranium</i> sp. 5	Naked Cranesbill				1						
<i>Glycine ?tabacina</i>	Variable Glycine							3			
<i>Haloragis heterophylla</i>	Varied Raspwort	3		2							
<i>Kennedia prostrata</i>	Running Postman	2		2				2	3		
<i>Opercularia ovata</i>	Broad-leaf Stinkweed	3		3							
<i>Opercularia varia</i>	Variable Stinkweed	3		3							
<i>Oxalis exilis/perennans</i>	Wood-sorrel	2		2	2	2	2	2	2		2
<i>Rumex brownii</i>	Slender Dock			3							
<i>Solenogyne dominii</i>	Solenogyne	2		2				2			
<i>Solenogyne gunnii</i>	Solenogyne	2		2				2			
<i>Tricoryne elatior</i>	Yellow Rush-lily	2		2	3	3	3	2	3		2
<i>Veronica gracilis</i>	Slender Speedwell	2		2	3	3	3	3	2		3
<i>Veronica plebeia</i>	Trailing Speedwell	2			3	2	2		2		3
<i>Viola hederacea</i>	Ivy-leaf Violet	2			3	2	2		2		3
Aquatics											
<i>Alisma plantago-aquatica</i>	Water Plantain							1			1
<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass							3			
<i>Azolla filiculoides</i>	Pacific Azolla							2			1
<i>Crassula helmsii</i>	Swamp Crassula				3			2			1
<i>Landoltia punctata</i>	Thin Duckweed							2			2
<i>Lemna disperma</i>	Common Duckweed							2			1
<i>Myriophyllum crispatum</i>	Upright Milfoil							2			1
<i>Otelia ovalifolia</i> subsp. <i>ovalifolia</i>	Swamp Lily							3			2
<i>Spirodela</i> – see <i>Landoltia</i>											
<i>Potamogeton crispus</i>	Curly Pondweed							3			2
<i>Potamogeton ochreatus</i>	Blunt Pondweed							2			1
<i>Rumex bidens</i>	Mud Dock							3			3
<i>Schoenoplectus tabernaemontani</i>	River Club-rush				2			3			
<i>Schoenoplectus validus</i> = <i>S. tabernaemontani</i>											
<i>Triglochin procera</i>	Water-ribbons							1			1
<i>Triglochin striatum</i> (flat leaves)	Streaked Arrowgrass					3	2	2			3
<i>Typha domingensis</i>	Cumbungi				3			3			3

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<i>Typha orientalis</i>	Cumbungi				3			3			3	
<i>Wolffia australiana</i>	Tiny Duckweed							2			1	
Non-woody mud-lovers												
<i>Alternanthera denticulata</i>	Lesser Joyweed		2		2	3		1			1	
<i>Centipeda elatinooides</i>	Elatine Sneezeweed							3				
<i>Chenopodium pumilio</i>	Clammy Goosefoot							3				
<i>Elatine gratioloides</i>	Waterwort							3			3	
<i>Hypericum japonicum</i>	Matted St John's Wort							3			3	
<i>Lobelia pedunculata</i>	Matted Pratia				3			3			3	
<i>Neopaxia australasica</i>	White Purslane		3					3			3	
<i>Persicaria decipiens</i>	Slender Knotweed		2		2	2	2	1			1	
<i>Persicaria hydropiper</i>	Water-pepper				2			3			3	
<i>Persicaria praetermissa</i>	Spotted Knotweed							2			2	
<i>Persicaria prostrata</i>	Creeping Knotweed				3			2			3	
<i>Persicaria subsessilis</i>	Hairy Knotweed				3			2			2	

Appendix D – Inventory of Environmental Weeds

The table beginning on the next page lists 210 naturalised plant species that were recorded within remnant vegetation during fieldwork in Boroondara (which excluded Yarra Bend Park). ‘Naturalised’ means that they have been introduced and now reproduce and persist without deliberate human assistance. A few naturalised plant species that are environmentally inconsequential and appear occasionally after recent soil disturbance have been omitted from the list. The term ‘environmental weed’ applies to a naturalised plant that has a significant adverse effect on indigenous flora or fauna.

The level of threat or impact of each weed species is categorised using the scale:

- V** Very serious;
- S** Serious;
- M** Moderate;
- Insignificant, but may have negative visual impact.

These categories are defined precisely in Section 2.3.3 (p. 12)

During the fieldwork, this scale was used to rate the level of threat or impact of weed species for each individual site. The table on the next page gives the number of sites in which each threat rating was applied to each species. The ratings for individual sites were then used to obtain an overall rating for each species in the whole of Boroondara. There appears to be no published method available to determine a weed species’ threat rating for a municipality (or similar area) from a set of site-by-site ratings, so a method has been devised here.

The threat rating for the whole municipality should not be defined as either the highest or lowest threat rating of the individual sites, because the extremes are often quite unrepresentative of the overall threat to the municipality’s natural assets. One might consider using the mean or median of the threat ratings at the individual sites, but the present author found that this tends to understate the threat to the whole municipality. Instead, he favours the 75-percentile (i.e. intermediate between the median and the maximum threat rating), with provisos.

For technically inclined readers, the procedure chosen to determine the threat rating of a species for the whole of Boroondara was as follows:

- For each weed species, the threat ratings for individual sites where the species grows were divided into two groups: the 25% of sites with the highest threat ratings for the species, and the remaining 75%. The lowest threat rating in the 25% group was chosen as a preliminary estimate of the municipal-scale threat rating for the species;
- For a small number of weed species that appear to be in a phase of rapid expansion, the figure of 25% was reduced;
- The preliminary threat rating was downgraded by one category for weed species present at no more than three or four sites, except that no species was downgraded to ‘insignificant’ if the author believed that this would understate the species’ true threat.

The resultant threat ratings appear in the column headed ‘Threat Rating – Boroondara’ in the table below.

The last column in the table gives threat ratings for Victoria as a whole, adapted from Carr, Yugovic and Robinson (1992). Blank entries in the last column indicate that the species was not listed by Carr *et al.*

The scientific names of weeds covered by the Catchment and Land Protection Act 1994 are underlined.

Scientific names follow the Department of Sustainability & Environment’s Flora Information System as at June 2005, which in turn follows Ross and Walsh (2003). Synonyms are given for names that have lost favour in recent years. Common names follow ‘*Flora of Victoria*’ (Walsh and Entwisle 1994, 1996, 1999) where available, defaulting to Beaglehole (1983) and then to the names used in the Flora Information System. To assist interpretation of the list as taxonomy changes, the column headed ‘FIS code’ gives each species’ code number in the Department of Sustainability & Environment’s Flora Information System (or FIS). Even as plant names change, the code numbers should remain the same (although there have been lapses in the FIS’s history).

Weed threat ratings below are: **V** = very serious; **S** = serious; **M** = moderate; **-** = insignificant.

FIS Code	Scientific Name	Common Name	Number of sites where rated...					Threat Rating	
			V	S	M	-	Total	Boroondara	Vic
14	<i>Acacia baileyana</i>	Cootamundra Wattle	-	-	1	3	4	-	V
31	<i>Acacia elata</i>	Cedar Wattle	-	-	1	-	1	M	V
36	<i>Acacia floribunda</i>	White-sallow Wattle	-	-	-	1	1	-	M
44	<i>Acacia howittii</i>	Sticky Wattle	-	-	-	1	1	-	
53	<i>Acacia longifolia</i> subsp. <i>longifolia</i>	Sallow Wattle	-	-	5	-	5	M	V
84	<i>Acacia saligna</i>	Orange (or Golden Wreath) Wattle	-	1	-	3	4	M	
4389	<i>Acer negundo</i>	Box Elder	-	3	7	-	10	S	M
115	<i>Acmena smithii</i>	Lilly Pilly	-	-	1	1	2	-	
3638	<i>Agapanthus praecox</i> subsp. <i>orientalis</i>	Agapanthus	-	1	3	2	6	M	S
153	<i>Agrostis capillaris</i>	Brown-top Bent	-	1	7	2	10	M	V
164	<i>Aira caryophyllea</i>	Silvery Hair-grass	-	-	3	1	4	M	S
166	<i>Aira elegantissima</i>	Elegant Hair-grass	-	-	1	1	2	-	S
173	<i>Alisma lanceolata</i>	Water Plantain	-	-	1	-	1	M	M
179	<i>Allium triquetrum</i> *	Angled Onion	-	3	9	-	12	S	V
3641	<i>Alstroemeria aurea</i>	Yellow Alstroemeria	-	-	1	-	1	M	V
5165	<i>Alternanthera philoxeroides</i>	Alligator Weed	-	1	-	-	1	S	
223	<i>Anagallis arvensis</i>	Pimpernel	-	-	-	3	3	-	S
3632	<i>Anredera cordifolia</i>	Madeira Vine	-	-	2	-	2	M	S
236	<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass	-	4	7	-	11	S	V
252	<i>Araujia sericifera</i>	White Bladder-flower	-	4	4	-	8	S	M
253	<i>Arbutus unedo</i>	Irish Strawberry Tree	-	-	1	-	1	M	M
255	<i>Arctotheca calendula</i>	Cape Weed	-	-	2	4	6	M	S
267	<i>Artemisia verlotiorum</i>	Chinese Wormwood	-	-	1	-	1	M	V
5391	<i>Arundo donax</i>	Giant Reed	-	-	1	1	2	M	M
274	<i>Asparagus asparagoides</i>	Bridal Creeper	-	-	1	-	1	M	V
276	<i>Asparagus scandens</i>	Asparagus Fern	-	-	1	-	1	M	V
297	<i>Aster subulatus</i>	Aster-weed	-	-	8	9	17	M	S
318	<i>Atriplex prostrata</i>	Hastate Orache	-	1	8	1	10	M	S
340	<i>Avena barbata</i>	Bearded Oat	-	1	3	-	4	M	S
384	<i>Bellis perennis</i>	English Daisy	-	-	-	1	1	-	
488	<i>Brassica fruticulosa</i>	Twiggy Turnip	-	2	9	1	12	M	M
495	<i>Briza maxima</i>	Large Quaking-grass	-	4	4	-	8	S	V
496	<i>Briza minor</i>	Lesser Quaking-grass	-	-	2	4	6	M	M
498	<i>Bromus catharticus</i>	Prairie Grass	-	-	20	-	20	M	V
500	<i>Bromus diandrus</i>	Great Brome	1	3	4	-	8	S	V
501	<i>Bromus hordeaceus</i>	Soft Brome	-	-	1	2	3	M	S
503	<i>Bromus ?madritensis</i>	Compact Brome	-	-	1	-	1	M	S
574	<i>Callitriche stagnalis</i>	Water Starwort	-	-	4	-	4	M	M
605	<i>Calystegia silvatica</i>	Greater Bindweed	-	-	2	-	2	M	S
614	<i>Cardamine hirsuta</i>	Hairy Wood-cress	-	-	1	1	2	M	M
702	<i>Centaurium erythraea</i>	Common Centaury	-	-	2	6	8	M	S
705	<i>Centaurium tenuiflorum</i>	Branched Centaury	-	-	-	3	3	-	S
719	<i>Cerastium glomeratum</i>	Common Mouse-ear Chickweed	-	-	4	2	6	M	S
946	<i>Chamaecytisus palmensis</i>	Tree Lucerne	-	1	-	-	1	M	V
4359	<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i> *	Boneseed	-	1	4	-	5	M	V
782	<i>Cirsium vulgare</i> *	Spear Thistle	-	-	11	2	13	M	S
790	<i>Clematis microphylla</i>	Small-leafed Clematis	-	1	-	-	1	M	
803	<i>Conium maculatum</i> *	Hemlock	-	-	4	1	5	M	S
808	<i>Convolvulus arvensis</i>	Common Bindweed	-	-	1	-	1	M	
810	<i>Conyza sumatrensis</i> = <i>C. albida</i>	Fleabane	-	-	4	9	13	M	S
823	<i>Coprosma repens</i>	Mirror-bush	-	-	16	1	17	M	V
4393	<i>Cordyline australis</i>	New Zealand Cabbage Tree	-	-	1	2	3	-	M
825	<i>Cortaderia selleana</i>	Pampas Grass	-	-	1	-	1	M	V

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843	<i>Cotoneaster glaucophyllus</i>	Cotoneaster	-	1	11	-	12	M	V
844	<i>Cotoneaster pannosus</i>	Cotoneaster	-	3	3	-	6	S	V
848	<i>Cotula coronopifolia</i>	Water Buttons	-	-	-	5	5	-	S
5186	<i>Crassula multicava</i>	Shade Crassula	-	-	2	-	2	M	M
867	<i>Crataegus monogyna</i> *	Hawthorn	-	4	8	-	12	S	V
875	<i>Crocsmia ×crocsmiiflora</i>	Montbretia	-	-	1	-	1	M	V
4554	<i>Cynodon dactylon</i>	Couch	-	6	13	-	19	S	V
912	<i>Cynosurus echinatus</i>	Rough Dog's-tail	-	-	-	1	1	-	S
918	<i>Cyperus eragrostis</i>	Drain Flat-sedge	-	3	15	-	18	M	S
936	<i>Cyperus tenellus</i>	Tiny Flat-sedge	-	-	3	1	4	M	M
947	<i>Cytisus scoparius</i> *	English Broom	-	1	1	-	2	M	V
948	<i>Dactylis glomerata</i>	Cocksfoot	-	5	15	-	20	S	S
986	<i>Datura stramonium</i> *	Common Thorn-apple	-	-	-	1	1	-	S
3118	<i>Delairea odorata</i>	Cape Ivy	-	2	5	-	7	S	V
	<i>Diets ?iridioides</i>	Diets	-	-	1	-	1	M	
1118	<i>Echinochloa crus-galli</i>	Common Barnyard Grass	-	-	3	3	6	M	
1119	<i>Echinochloa esculenta</i>	Barnyard Grass	-	-	-	1	1	-	
1128	<i>Ehrharta erecta</i>	Panic Veldt-grass	1	10	21	-	32	S	V
1129	<i>Ehrharta longiflora</i>	Annual Veldt-grass	1	3	9	-	13	S	V
1176	<i>Epilobium ciliatum</i>	Glandular Willow-herb	-	-	1	1	2	-	M
1191	<i>Eragrostis mexicana</i>	Mexican Love-grass	-	-	3	-	3	M	
1210	<i>Erica lusitanica</i>	Spanish Heath	-	1	1	-	2	M	V
1212	<i>Erigeron karvinskianus</i>	Bony-tip Fleabane	-	-	1	2	3	-	
1263	<i>Eucalyptus cladocalyx</i>	Sugar Gum	-	-	1	-	1	-	S
1332	<i>Euphorbia peplus</i>	Petty Spurge	-	-	2	2	4	-	
2627	<i>Fallopia convolvulus</i>	Black Bindweed	-	1	1	-	2	M	
1356	<i>Festuca arundinacea</i>	Tall Fescue	-	-	1	1	2	-	S
1363	<i>Festuca rubra</i>	Red Fescue	-	-	-	1	1	-	M
1370	<i>Foeniculum vulgare</i> *	Fennel	-	3	16	-	19	S	V
4301	<i>Fraxinus angustifolia</i>	Desert Ash	-	7	14	-	21	S	V
1399	<i>Galenia pubescens</i>	Galenia	-	-	4	1	5	M	S
1402	<i>Galium aparine</i>	Cleavers	-	8	15	-	23	S	V
4653	<i>Gamochoeta calviceps</i>	Grey Cudweed	-	-	-	1	1	-	
4336	<i>Gamochoeta purpurea</i>	Spiked Cudweed	-	-	1	2	3	-	S
1417	<i>Gaudinia fragilis</i>	Fragile Oat	-	-	-	1	1	-	
1421	<i>Genista linifolia</i> *	Flax-leaved Broom	-	1	3	-	4	M	V
1422	<i>Genista monspessulana</i> *	Montpellier Broom	-	4	4	-	8	S	V
1426	<i>Geranium dissectum</i>	Cut-leaf Cranesbill	-	-	-	1	1	-	
1428	<i>Geranium molle</i> var. <i>molle</i>	Dovesfoot	-	-	-	1	1	-	M
7157	<i>Grevillea robusta</i>	Southern Silky Oak	-	-	-	1	1	-	
1550	<i>Grevillea rosmarinifolia</i>	Rosemary Grevillea	-	-	-	1	1	-	S
5748	<i>Hakea salicifolia</i>	Willow-leaf Hakea	-	-	-	1	1	-	V
1599	<i>Hedera helix</i>	Ivy	-	4	9	-	13	S	V
2511	<i>Helminthotheca echioides</i>	Ox-tongue	-	-	6	2	8	M	S
1692	<i>Holcus lanatus</i>	Yorkshire Fog	-	1	10	-	11	M	V
1748	<i>Hypochoeris radicata</i>	Cat's Ear	-	1	16	-	17	M	S
1762	<i>Ipomoea indica</i>	Lear's Morning-glory	-	-	5	-	5	M	S
3784	<i>Iris pseudacorus</i>	Yellow Flag	-	-	2	-	2	M	S
1797	<i>Ixia polystachya</i>	Variable Ixia	-	-	2	-	2	-	M
1806	<i>Juncus articulatus</i>	Jointed Rush	-	1	4	-	5	M	V
3800	<i>Juncus capillaceus</i>	String Rush	-	-	1	-	1	M	M
1813	<i>Juncus capitatus</i>	Dwarf Rush	-	-	1	4	5	-	M
1844	<i>Juncus tenuis</i>	Slender Rush	-	-	-	1	1	-	
1860	<i>Lactuca serriola</i>	Prickly Lettuce	-	-	-	4	4	-	M

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1895	<i>Leontodon taraxacoides</i>	Hairy Hawkbit	-	-	3	1	4	-	S
1896	<i>Lepidium africanum</i>	Common Pepper-cress	-	-	6	1	7	M	M
826	<i>Lepidium didymum</i>	Lesser Swine's-cress	-	-	-	2	2	-	
772	<i>Leucanthemum vulgare</i>	Ox-eye Daisy	-	-	-	1	1	-	M
2002	<i>Ligustrum lucidum</i>	Large-leaved Privet	-	3	8	-	11	S	M
4689	<i>Ligustrum vulgare</i>	European Privet	-	-	1	-	1	M	
2018	<i>Linum trigynum</i>	French Flax	-	-	-	2	2	-	M
2036	<i>Lolium perenne</i>	Perennial Rye-grass	-	-	8	3	11	M	S
2053	<i>Lonicera japonica</i>	Japanese Honeysuckle	-	-	3	-	3	M	V
	<i>Lotus suaveolens</i> = <i>L. subbiflorus</i>								
2060	<i>Lotus subbiflorus</i>	Hairy Bird's-foot Trefoil	-	1	2	1	4	M	S
2078	<i>Lycium ferocissimum</i> *	African Box-thorn	-	1	8	-	9	M	V
1884	<i>Malva linnaei</i>	Cretan Hollyhock	-	-	-	1	1	-	
2121	<i>Malva nicaeensis</i>	Mallow of Nice	-	-	-	1	1	-	
2140	<i>Medicago polymorpha</i>	Burr Medic	-	-	-	1	1	-	S
2169	<i>Mentha pulegium</i>	Pennyroyal	-	-	-	2	2	-	S
2213	<i>Modiola caroliniana</i>	Carolina Mallow	-	2	7	1	10	M	M
3997	<i>Nassella leucotricha</i>	Pale Needle-grass	-	-	1	-	1	M	
3282	<i>Nassella neesiana</i>	Chilean Spear-grass	-	3	5	-	8	M	V
2263	<i>Nassella trichotoma</i> *	Serrated Tussock	-	1	3	1	5	M	V
2948	<i>Nasturtium officinale</i>	Watercress	-	1	5	-	6	M	S
2294	<i>Olea europaea</i>	Olive	-	1	-	-	1	M	S
2383	<i>Oxalis incarnata</i>	Pale Wood-sorrel	-	2	4	-	6	M	S
2387	<i>Oxalis pes-caprae</i>	Soursob	-	4	3	-	6	S	V
169	<i>Paraserianthes lophantha</i>	Cape Wattle	-	-	2	-	2	-	V
2423	<i>Parietaria judaica</i>	Wall Pellitory	-	-	1	-	1	M	
2430	<i>Paspalum dilatatum</i>	Paspalum	-	-	9	1	10	M	V
2431	<i>Paspalum distichum</i>	Water Couch	-	7	2	-	9	S	V
2432	<i>Passiflora caerulea</i>	Brazilian Passion-flower	-	-	1	-	1	-	M
3932	<i>Passiflora tarminiana</i>	Banana Passionfruit	-	-	1	-	1	-	V
2450	<i>Pennisetum alopecuroides</i>	Swamp Foxtail-grass	-	-	1	-	1	-	S
2451	<i>Pennisetum clandestinum</i>	Kikuyu	-	13	6	-	19	S	V
2633	<i>Persicaria maculosa</i>	Persicaria	-	-	3	3	6	M	M
2474	<i>Petrorhagia dubia</i>	Hairy Pink	-	-	-	1	1	-	
2476	<i>Phalaris aquatica</i>	Toowoomba Canary-grass	-	1	12	-	13	M	V
2538	<i>Pinus pinaster</i>	Maritime Pine	-	-	1	-	1	-	V
2539	<i>Pinus radiata</i>	Monterey Pine	-	-	3	-	3	M	V
2372	<i>Piptatherum miliaceum</i>	Rice Millet	-	2	5	-	7	M	M
2543	<i>Pittosporum undulatum</i>	Sweet Pittosporum	-	7	12	1	20	S	V
2553	<i>Plantago coronopus</i>	Buck's-horn Plantain	-	-	4	1	5	M	S
2561	<i>Plantago lanceolata</i>	Ribwort	-	2	21	1	24	M	S
2562	<i>Plantago major</i>	Greater Plantain	-	-	6	-	6	M	M
2580	<i>Poa annua</i>	Annual Meadow-grass	-	-	1	1	2	-	
2622	<i>Polycarpon tetraphyllum</i>	Four-leaved Allseed	-	2	5	-	7	M	M
2626	<i>Polygonum aviculare</i>	Prostrate Knotweed	-	-	2	4	6	M	
2679	<i>Populus alba</i>	White Poplar	-	-	2	1	3	M	M
2757	<i>Prunella vulgaris</i>	Self-heal	-	-	1	1	2	-	
2758	<i>Prunus cerasifera</i>	Cherry-plum	-	3	13	-	16	M	V
6575	<i>Pseudoscleropodium purum</i>	a moss	-	1	-	-	1	M	
4878	<i>Pyracantha angustifolia</i>	Orange Firethorn	-	-	2	-	2	-	V
2884	<i>Quercus robur</i>	English Oak	-	3	6	2	11	M	
2906	<i>Ranunculus repens</i>	Creeping Buttercup	-	3	7	-	10	S	S
2917	<i>Raphanus raphanistrum</i>	Wild Radish	-	-	1	3	4	-	
2939	<i>Ricinus communis</i>	Castor Oil Plant	-	1	1	-	2	M	M

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3967	<i>Robinia pseudoacacia</i>	Locust Tree	-	1	-	-	1	M	S
2942	<i>Romulea rosea</i>	Common Onion-grass	-	2	8	1	11	M	V
2949	<i>Rorippa palustris</i>	Yellow Marsh-cress	-	1	3	-	4	M	S
2950	<i>Rosa rubiginosa</i> *	Sweet Briar	-	-	2	-	2	M	V
2959	<i>Rubus anglocandicans</i> = <i>R. discolor</i> *	Blackberry	2	6	13	-	21	S	V
2969	<i>Rumex conglomeratus</i>	Clustered Dock	-	2	7	-	9	M	S
2970	<i>Rumex crispus</i>	Curled Dock	-	-	3	1	4	M	S
2973	<i>Rumex obtusifolius</i>	Broad-leaf Dock	-	-	1	-	1	M	
2985	<i>Sagina apetala</i>	Common Pearlwort	-	-	1	2	3	-	
2989	<i>Salix babylonica</i>	Weeping Willow	-	3	2	2	7	S	S
2991	<i>Salix fragilis</i> group	Crack Willows	-	4	1	-	5	S	
5115	<i>Salix matsudana</i> 'Tortuosa'	Tortured Willow	-	-	1	1	2	-	
5119	<i>Salix ×reichardtii</i>	Pussy Willow	-	-	2	-	2	M	
3993	<i>Salix ?×rubens</i>	White Crack Willow	-	1	-	-	1	M	V
5121	<i>Salix ×sepulcralis</i> var. <i>chrysocoma</i>	Golden Weeping Willow	-	-	2	-	2	-	
2992	<i>Salpichroa organifolia</i>	Pampas Lily-of-the-Valley	-	5	5	-	10	S	V
3027	<i>Schinus molle</i>	Pepper Tree	-	1	-	-	1	M	S
4965	<i>Silene gallica</i>	French Catchfly	-	-	1	-	1	-	M
3168	<i>Solanum americanum</i>	Glossy Nightshade	-	-	4	-	4	M	M
3995	<i>Solanum mauritianum</i>	Tobacco-bush	-	2	5	-	7	S	M
3183	<i>Solanum nigrum</i>	Black Nightshade	-	-	13	5	18	M	S
3187	<i>Solanum pseudocapsicum</i>	Madeira Winter-cherry	-	3	10	-	13	M	V
3194	<i>Soleirolia soleirolii</i>	Baby's Tears	-	-	-	1	1	-	
3197	<i>Solidago canadensis</i>	Goldenrod	-	-	2	-	2	-	
3202	<i>Sollya heterophylla</i>	Bluebell Creeper	-	-	2	1	3	-	V
3203	<i>Sonchus asper</i>	Rough Sow-thistle	-	-	-	4	4	-	S
3204	<i>Sonchus oleraceus</i>	Sow-thistle	-	-	1	19	20	-	S
3208	<i>Sparaxis bulbifera</i>	Sparaxis	-	-	1	-	1	-	V
3226	<i>Sporobolus africanus</i>	Indian Rat-tail Grass	-	2	8	-	10	M	S
3251	<i>Stellaria media</i>	Chickweed	-	-	1	-	1	-	S
3260	<i>Stenotaphrum secundatum</i>	Buffalo Grass	-	-	1	-	1	-	
9122	<i>Taraxacum</i> sp.	Dandelion	-	-	2	5	7	M	M
3416	<i>Tradescantia fluminensis</i>	Wandering Jew	1	12	7	-	20	S	V
3417	<i>Tragopogon porrifolius</i>	Salsify	-	-	-	1	1	-	M
2547	<i>Tribolium acutiflorum</i>	Desmazeria	-	-	1	1	2	-	M
3423	<i>Trifolium angustifolium</i>	Narrow-leaf Clover	-	1	1	1	3	M	S
3425	<i>Trifolium campestre</i>	Hop Clover	-	-	-	1	1	-	S
3427	<i>Trifolium dubium</i>	Suckling Clover	-	-	1	4	5	-	S
3435	<i>Trifolium repens</i>	White Clover	-	-	4	3	7	M	V
4006	<i>Tropaeolum majus</i>	Nasturtium	-	1	3	-	4	M	M
3471	<i>Ulex europaeus</i> *	Gorse (Furze)	1	8	5	-	14	S	V
5716	<i>Ulmus</i> aff. <i>procera</i>	Common Elm	-	-	2	1	3	M	
3496	<i>Verbena bonariensis</i>	Purple-top Verbena	-	-	8	-	8	M	S
3511	<i>Veronica persica</i>	Persian Speedwell	-	-	-	2	2	-	
3516	<i>Vicia hirsuta</i>	Tiny Vetch	-	1	5	-	6	M	M
3518	<i>Vicia sativa</i>	Common Vetch	-	1	3	-	4	M	S
3524	<i>Vinca major</i>	Blue Periwinkle	-	3	4	-	7	S	V
3531	<i>Viola odorata</i>	Fragrant Violet	-	-	1	-	1	-	M
3544	<i>Vulpia bromoides</i>	Squirrel-tail Fescue	-	3	9	-	12	S	V
3549	<i>Vulpia myuros</i>	Rat's-tail Fescue	-	1	4	-	5	M	S
3562	<i>Watsonia meriana</i> var. <i>bulbillifera</i> *	Bulbil Watsonia	-	1	2	-	3	M	V
5762	<i>Westringia fruticosa</i>	Coast Rosemary	-	-	1	-	1	M	
3599	<i>Zantedeschia aethiopica</i>	White Arum Lily	-	-	6	2	8	M	V

* 'Regionally controlled' under the *Catchment and Land Protection Act 1994*.

Appendix E – Inventory of Fauna Species

The following lists include all reliable records of vertebrates and butterflies in Boroondara, either from this study's fieldwork or from other observers checked in this study.

The numbers in the column headed 'Code' are the species' code numbers in the Atlas of Victorian Wildlife, which are almost the same as in the Census of Australian Vertebrate Fauna in the case of vertebrates. An asterisk before a common name indicates that the species is introduced.

Taxonomy

Fauna species listed in the table below are given the scientific and common names used in the Australian Faunal Directory of the Federal Department of Environment and Heritage. The species in each list other than butterflies are ordered according to a systematic taxonomic sequence. The numbers in the columns headed 'Code' are the 'biocodes' used in the Census of Australian Vertebrate Species (CAVS), which are also used in the Atlas of Victorian Wildlife.

Conservation Status Nationally and in Victoria

In the tables below, the 'status' columns headed 'Vic' and 'EPBC' refer to the species' conservation status as listed by the Victorian Department of Sustainability & Environment (2003) and under the federal *Environment Protection and Biodiversity Conservation Act 1999* (as at June 2005). The abbreviations in those columns have the following meanings (in decreasing order of threats faced):

- C: Critically Endangered;
- E: Endangered;
- V: Vulnerable; and
- N: Near Threatened (but not yet meeting the criteria for the categories above).

Conservation Status in Greater Melbourne

The column headed 'Melb' in the tables shows the conservation status of species in the context of greater Melbourne, as determined by Beardsell (1997) in the NEROC report. The region adopted by Beardsell covers most of the Port Phillip catchment, including most of the Mornington Peninsula but none of the Bellarine Peninsula. For the sake of consistency, his status codes have been translated as follows:

Beardsell's code	Translated to...	Meaning...
R1	E	Endangered
R2	V	Vulnerable
R3	R	Rare (but with no significant risks known)
R4	N	Near Threatened
R5	S	Secure – Present every year and not at risk, but not abundant or widespread
Vag	T	Transient or vagrant – Very rarely present, not finding suitable habitat
Verm	Pest	Causing significant detriment to native flora or fauna
X	X	Extinct within this area, unlikely to be seen again in the foreseeable future
Esc	I	Introduced but not a pest
(none)	-	Not fitting any category above

Conservation Status in Boroondara

Within Boroondara, the categories above are augmented by the following (as explained in Section 2.4):

- DD: Data Deficient – Suspected to be at risk but without enough information to make a valid assessment;
- A: Abundant – Abundant at many locations and facing no risks in the short to medium term; and
- OV: Occasional visitor – Using habitat in Boroondara to fulfil only part of their needs, and only in some years.

Unlike Beardsell (1997), the Boroondara classifications are based on the international standard Red List criteria.

For some groups of fauna (notably butterflies), there is too little information to determine conservation status in Boroondara.

Observational Statistics

Several columns in the tables below are included to assist interpretation of how commonly and recently each species has been observed in Boroondara.

The column headed 'Last Record' indicates the year of the most recent observation, either in this study or in the records researched for this report.

'# Observers' indicates how many observers have reported each species in Boroondara. When a site has multiple records of a species, each with no observer name recorded, these observations are treated as being from a single observer. '# Records' indicates how many records of each species have been found (including this study). '# Sites' indicates the number of sites (as identified in this report) at which each species has been observed in Boroondara. Apart from all the identified sites, the remainder of Boroondara is treated as one site for this purpose.

Yarra Bend Park stands out as the most biologically significant site in Boroondara, and its management is quite different from other sites. Therefore, the column headed 'In YBP?' has been included to show which species occur there.

Butterflies

With one exception, the alphabetical list below comes from observations by Ian Faithful and Graeme Lorimer, as indicated by the initials in the 'Observers' column. The exception is the Orange Palm Dart, reported by Crosby (1990). It is quite likely that the list is incomplete. Pending a current major investigation of invertebrates by the Field Naturalists Club of Victoria (focused on Yarra Bend Park), this report offers no determination of the conservation status of butterflies within the context of Boroondara. No butterfly species in this table is listed as rare or threatened at the national or state level. The abbreviations 'Vag' and 'I' under 'status in Melb' refer to species that Beardsell (1997) regarded to be present only due to introduction of host food plants from outside the Melbourne region.

Common Name	Scientific Name	Status in Melb	Last Record	Observers	# Records	# Sites	In YBP?
Australian Admiral	<i>Vanessa itea</i>	-	2005	GL, IF	5	5	Yes
Australian Painted Lady	<i>Vanessa kershawi</i>	-	2005	GL, IF	15	14	Yes
*Cabbage White	<i>Pieris rapae rapae</i>	Pest	2005	GL, IF	28	25	Yes
Caper White	<i>Belenois java teutonia</i>	Vag	2005	GL, IF	4	4	Yes
Common Brown	<i>Heteronympha merope merope</i>	-	2005	GL, IF	22	19	Yes
Common Grass-blue	<i>Zizina labradus labradus</i>	-	2005	GL, IF	22	20	Yes
Dingy Swallowtail	<i>Papillio anactus</i>	I	2005	GL, IF	5	4	Yes
Dispar (or Barred) Skipper	<i>Dispar compacta</i>	-	1998	IF	2	2	Yes
Double-spotted Lineblue	<i>Nacaduba biocellata</i>	-	1998	IF	2	2	Yes
Imperial White	<i>Delias harpalyce</i>	-	1998	IF	2	2	Yes
Klug's Xenica	<i>Geitoneura klugii</i>	-	2005	GL, IF	4	4	Yes
Lesser Wanderer	<i>Danaus chrysippus petilia</i>	Vag	1978	IF	1	1	
Meadow Argus	<i>Junonia villida calybe</i>	S	1998	IF	2	2	Yes
Orange Palm Dart	<i>Cephrenes augiades sperthias</i>		1990	DC	1	1	
Pea Blue	<i>Lampides boeticus</i>	-	2004	GL, IF	3	3	Yes
Symmomus Skipper	<i>Trapezites symmumus symmumus</i>	-	2001	IF, PL	2	1	Yes
Wanderer	<i>Danaus plexippus plexippus</i>	Vag	1970	IF	1	1	
White Grassdart	<i>Taractrocera papyria papyria</i>	-	1998	IF	2	2	Yes
Wood White	<i>Delias aganippe</i>	-	1973	IF	1	1	
Yellow-banded Dart	<i>Ocybadistes walkeri sothis</i>	-	2005	GL, IF	10	10	Yes

Fishes

Species whose names are underlined below must migrate between freshwater and the sea during their lifecycle.

Code	Common Name	Scientific Name	Conservation Status				Last Record	# Obs- ervers	# Rec- ords	# Sites	In YBP ?
			Boro- ndara	Melb	Vic	EPBC					
4032	<u>Broadfin Galaxias</u>	<u>Galaxias brevipinnis</u>	V	V			2002	5	18	4	Yes
4033	<u>Australian (or Tas.) Mudfish</u>	<u>Neochanna cleaveri</u>	C	E	C		1991	1	1	1	Yes
4035	<u>Common Galaxias</u>	<u>Galaxias maculatus</u>	S	R			2002	3	60	3	Yes
4038	<u>Spotted Galaxias</u>	<u>Galaxias truttaceus</u>	V	E			1996	1	16	1	Yes
4116	Black Bream	<i>Acanthopagrus butcheri</i>	V	R			1991	1	4	1	Yes
4100	Yarra Pigmy Perch	<i>Nannoperca obscura</i>	X		NT	V	1872	1	1	1	
4140	*Yellowfin Goby	<i>Acanthogobius flavimanus</i>	Pest				2002	2	15	2	Yes
4043	*Goldfish	<i>Carassius auratus</i>	Pest	Pest			2002	4	24	4	Yes
4044	*Carp	<i>Cyprinus carpio</i>	Pest	Pest			2005	4	31	7	Yes
4046	*Roach	<i>Rutilus rutilus</i>	Pest	Pest			1996	2	55	2	Yes
4165	Flatheaded Gudgeon	<i>Philypnodon grandiceps</i>	V	V			2002	2	12	2	Yes
4002	<u>Pouched Lamprey</u>	<u>Geotria australis</u>	V	E			1994	1	2	1	Yes
4001	<u>Short-headed Lamprey</u>	<u>Mordacia mordax</u>	S	V			1996	1	18	2	Yes
4015	<u>Shortfin Eel</u>	<u>Anguilla australis</u>	S	-			2002	5	59	5	Yes
4026	*Rainbow Trout	<i>Oncorhynchus mykiss</i>	I				1996	1	1	1	Yes
4028	*Brown Trout	<i>Salmo trutta</i>	Pest	Pest			1994	2	14	2	Yes
4030	Australian Smelt	<i>Retropinna semoni</i>	V	R			1995	1	16	1	Yes
4031	<u>Australian Grayling</u>	<u>Prototroctes maraena</u>	V	E	V	V	1993	1	18	1	Yes
4050	Freshwater Catfish	<i>Tandanus tandanus</i>	I	I/R	E		2000	1	1	1	Yes
4048	*Oriental Weatherloach	<i>Misgurnus anguillicaudatus</i>	Pest	Pest			2002	6	28	5	Yes
4069	*Mosquitofish or Gambusia	<i>Gambusia holbrooki</i>	Pest	Pest			2005	6	25	7	Yes
4094	Murray Cod	<i>Maccullochella peelii peelii</i>	I	I/R	E		2000	1	3	1	Yes
4095	Golden Perch	<i>Macquaria ambigua</i>	I		V		1993	1	2	1	Yes
4096	Macquarie Perch	<i>Macquaria australasica</i>	I	I/R	E	E	1993	1	19	1	Yes
4098	Australian Bass	<i>Macquaria novemaculeata</i>	I	I/R			1991	1	2	1	Yes
4105	*Redfin	<i>Perca fluviatilis</i>	Pest	Pest			2000	3	12	3	Yes
4127	River Blackfish	<i>Gadopsis marmoratus</i>	X	V			1950	1	1	1	
4138	<u>Tupong</u>	<u>Pseudaphritis urvillii</u>	V	V			1996	1	16	1	Yes

Frogs

The column headed 'Certified' indicates the initials of the most recent observer who has confirmed with the author that they have definitely observed each species: GL = Graeme Lorimer (this study), CB = Cam Beardsell and PP = Paul Peake.

Code	Common Name	Scientific Name	Conservation Status				Last Record	# Obs- ervers	# Rec- ords	# Sites	In YBP?	Obs- erver
			Boro- ndara	Melb	Vic	EPBC						
3134	Common Froglet	<i>Crinia signifera</i>	S	-			2005	7	69	13	Yes	GL
3033	Victorian Smooth Froglet	<i>Geocrinia victoriana</i>	E	-			2005	5	13	6		GL
3058	Southern Bullfrog	<i>Limnodynastes dumerilii</i>	E	-			2005	5	28	5		GL
3061	Striped Marsh Frog	<i>Limnodynastes peronii</i>	E	S			2005	6	29	7		GL
3918	Spotted Marsh Frog	<i>Limnodynastes tasmaniensis</i>	E	-			2005	5	34	7	Yes	GL
3125	Southern Toadlet	<i>Pseudophryne semimarmorata</i>	X	S	V		1991	1	2	1		PP
3182	Southern Brown Tree Frog	<i>Litoria ewingii</i>	E	-			2005	9	94	12	Yes	GL
3183	*Eastern Dwarf Tree Frog	<i>Litoria fallax</i>	Pest				2005	1	4	1		GL
3204	Peron's Tree Frog	<i>Litoria peronii</i>	C	V			1998	1	1	1		CB
3207	Warty Bell Frog	<i>Litoria raniformis</i>	X	-	E	V	1970	2	10	1		CB
3906	Verreaux's Tree Frog	<i>Litoria verreauxii verreauxii</i>	E	-			1988	2	5	2		

Reptiles

The column headed 'Certified' indicates the initials of the most recent observer who has confirmed with the author that they have definitely observed each species: GL = Graeme Lorimer (this study), CB = Cam Beardsell and PL = Peter Lynch. Record dates of 1770 are used to indicate pioneers' observations.

Note that no reptile in Boroondara is listed under the *Environment Protection & Biodiversity Conservation Act 1999*.

Code	Common Name	Scientific Name	Conservation Status			Last Record	# Observers	# Records	# Sites	In YBP?	Certified
			Boroondara	Melb	Vic						
2017	Common Long-necked Tortoise	<i>Chelodina longicollis</i>	V	S		2005	7	8	6	Yes	GL
2126	Marbled Gecko	<i>Phyllodactylus marmoratus</i>	E	R		1991	3	7	3		
2194	Tree Dragon	<i>Amphibolurus muricatus</i>	C	-		1988	1	1	1	Yes	CB
2919	Gippsland Water Dragon	<i>Physignathus lesueurii howittii</i>	I	R		2003	2	2	2	Yes	PL
2948	Tussock Skink	<i>Pseudemoia pagenstecheri</i>	C	S		1988	1	2	2	Yes	CB
2682	Eastern Three-lined Skink	<i>Bassiana duperreyi</i>	X	-		1770	1	1	1		
2408	Cunningham's Skink	<i>Egernia cunninghami</i>	X	S		1988	1	1	1	Yes	CB
2430	White's Skink	<i>Egernia whitii</i>	C	NT		1993	1	1	1	Yes	PL
2956	Southern Water Skink	<i>Eulamprus tympanum tympanum</i>	C	-		1988	1	1	1	Yes	CB
2450	Delicate Skink	<i>Lampropholis delicata</i>	V	S		2004	1	1	1		CB
2451	Garden Skink	<i>Lampropholis guichenoti</i>	S	-		2004	4	5	5	Yes	GL
2475	Bougainville's Skink	<i>Lerista bougainvillii</i>	C	S		1991	2	2	2	Yes	CB
2683	Glossy Grass Skink	<i>Pseudemoia rawlinsoni</i>	C	V	N	1991	1	1	1		CB
2452	Weasel Skink	<i>Saproscincus mustelinus</i>	V	-		1993	4	19	4	Yes	CB
2578	Blotched Blue-tongued Lizard	<i>Tiliqua nigrolutea</i>	E	-		2005	1	1	1	Yes	PL
2580	Common Blue-tongued Lizard	<i>Tiliqua scincoides</i>	E	-		2005	2	2	2	Yes	GL
2681	Tiger Snake	<i>Notechis scutatus</i>	S	-		2005	8	12	8	Yes	GL
2699	Eastern Brown Snake	<i>Pseudonaja textilis</i>	C	-		2003	2	2	2		CB
2727	Little Whip Snake	<i>Suta flagellum</i>	X	S		1770	1	2	1		

Mammals

The initials in the column headed 'Certified' are the same as for reptiles.

Code	Common Name	Scientific Name	Conservation Status				Last Record	# Observers	# Records	# Sites	In YBP?	Certified
			Boroondara	Melb	Vic	EPBC						
1001	Platypus	<i>Ornithorhynchus anatinus</i>	E	NT			2005	10	17	7	Yes	CB
1003	Short-beaked Echidna	<i>Tachyglossus aculeatus</i>	C	-			2002	5	6	2	Yes	
1009	Eastern Quoll	<i>Dasyurus viverrinus</i>	X	X	X		1948	1	5	1	Yes	
1092	Southern Brown Bandicoot	<i>Isodon obesulus obesulus</i>	X	V	N	E	1948	1	1	1		
1098	Eastern Barred Bandicoot	<i>Perameles gunnii</i>	X	X	C	E	1886	2	2	2	Yes	
1113	Common Brushtail Possum	<i>Trichosurus vulpecula</i>	A	-			2005	31	97	21	Yes	GL
1138	Sugar Glider	<i>Petaurus breviceps</i>	OV	-			1986	1	1	1	Yes	CB
1129	Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>	A	-			2005	30	136	23	Yes	GL
1265	Eastern Grey Kangaroo	<i>Macropus giganteus</i>	T	-			2001	1	1	1	Yes	PL
1242	Black Wallaby	<i>Wallabia bicolor</i>	OV	-			2004	3	4	2	Yes	PL
1280	Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	S	R	V	V	2005	10	21	7	Yes	GL
1324	White-striped Freetail Bat	<i>Nyctinomus australis</i>	V	-			2004	3	6	3	Yes	CB

Code	Common Name	Scientific Name	Conservation Status				Last Record	# Observers	# Records	# Sites	In YBP?	Certified
			Boroondara	Melb	Vic	EPBC						
1349	Gould's Wattled Bat	<i>Chalinolobus gouldii</i>	DD	-			1991	3	3	2		
1351	Chocolate Wattled Bat	<i>Chalinolobus morio</i>	DD	-			2003	2	2	2		
1335	Lesser Long-eared Bat	<i>Nyctophilus geoffroyi</i>	DD	-			1988	1	1	1	Yes	CB
1379	Little Forest Bat	<i>Vespadelus vulturinus</i>	DD	-			1989	4	4	4	Yes	
1415	Water Rat or Rakali	<i>Hydromys chrysogaster</i>	E	S			2004	8	11	9	Yes	
1412	*House Mouse	<i>Mus musculus</i>	Pest	Pest			1989	2	2	2		
1409	*Brown Rat	<i>Rattus norvegicus</i>	Pest	Pest			1989	1	1	1		
1408	*Black Rat	<i>Rattus rattus</i>	Pest	Pest			2005	6	10	5	Yes	GL
1509	*Eastern Grey Squirrel	<i>Sciurus carolinensis</i>	X				1933	1	1	1		
1532	*Red Fox	<i>Canis vulpes</i>	Pest	Pest			2005	7	11	8	Yes	GL
1536	*Cat (feral)	<i>Felis catus</i>	Pest	Pest			1988	1	1	1		
1510	*European Rabbit	<i>Oryctolagus cuniculus</i>	Pest	Pest			2001	6	9	2	Yes	CB

Birds

The ordering of the list below follows the current sequence recommended by Birds Australia (as far as possible).

The column headed 'Certified' provides initials of one of several, particularly trusted observers who has personally observed the species. In many cases, more than one of these people have observed the species, in which case the initials have been selected according to the following order of precedence:

Graeme Lorimer in this study (GL), David Lockwood in this study (DL), Fred T.H. Smith (FS), Cam Beardsell (CB) and Peter Lynch (PL)

Code	Common Name	Scientific Name	Conservation Status				Last Record	# Observers	# Records	# Sites	In YBP?	Certified
			Boroondara	Melb	Vic	EPBC						
9	Stubble Quail	<i>Coturnix pectoralis</i>	X	-				1	2	2	Yes	FS
10	Brown Quail	<i>Coturnix ypsilophora</i>	OV	NT	NT		1985	1	1	1	Yes	FS
203	Black Swan	<i>Cygnus atratus</i>	OV	-			2000	2	5	2	Yes	CB
735	*Domestic Goose		Pest				2005	1	1	1		GL
202	Australian Wood Duck	<i>Chenonetta jubata</i>	S	-			2005	21	117	19	Yes	GL
948	*Mallard	<i>Anas platyrhynchos</i>	Pest	Pest			2005	9	15	7	Yes	GL
208	Pacific Black Duck	<i>Anas superciliosa</i>	A	-			2005	29	164	26	Yes	GL
211	Grey Teal	<i>Anas gracilis</i>	OV	-			2000	2	2	2	Yes	
210	Chestnut Teal	<i>Anas castanea</i>	S	-			2005	17	41	16	Yes	GL
215	Hardhead	<i>Aythya australis</i>	OV	R	VU		2003	2	2	2		
61	Australasian Grebe	<i>Tachybaptus novaehollandiae</i>	OV	-			1992	5	6	5	Yes	CB
62	Hoary-headed Grebe	<i>Poliiocephalus poliocephalus</i>	OV	-			2001	1	5	1	Yes	
60	Great Crested Grebe	<i>Podiceps cristatus</i>	OV	R			1988	1	1	1		
101	Darter	<i>Anhinga melanogaster</i>	E	R			2004	8	26	5	Yes	DL
100	Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>	V	-			2005	18	55	15	Yes	GL
99	Pied Cormorant	<i>Phalacrocorax varius</i>	OV	S	NT		2001	2	2	2	Yes	
97	Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	V	-			2005	12	53	12	Yes	GL
96	Great Cormorant	<i>Phalacrocorax carbo</i>	E	-			2004	8	25	4	Yes	DL
106	Australian Pelican	<i>Pelecanus conspicillatus</i>	OV	S			2002	4	6	5	Yes	GL
188	White-faced Heron	<i>Egretta novaehollandiae</i>	V	-			2005	18	53	16	Yes	GL
189	White-necked Heron	<i>Ardea pacifica</i>	OV	-			2005	6	7	5		CB
187	Great Egret	<i>Ardea alba</i>	OV	S	VU		2004	5	9	5	Yes	CB
186	Intermediate Egret	<i>Ardea intermedia</i>	OV	E	CR		2001	1	1	1		
977	Cattle Egret	<i>Ardea ibis</i>	OV	S			1999	3	3	3		FS
192	Nankeen Night Heron	<i>Nycticorax caledonicus</i>	E	S	NT		2005	10	17	7	Yes	GL
195	Little Bittern	<i>Ixobrychus minutus</i>	X	V	EN		1950	1	1	1		FS
179	Australian White Ibis	<i>Threskiornis molucca</i>	S	-			2005	11	22	11	Yes	GL

Code	Common Name	Scientific Name	Conservation Status				Last Record	# Observers	# Records	# Sites	In YBP?	Certified
			Boroondara	Melb	Vic	EPBC						
180	Straw-necked Ibis	<i>Threskiornis spinicollis</i>	OV	-			1992	2	2	2	Yes	CB
181	Royal Spoonbill	<i>Platalea regia</i>	OV	S	VU		1992	1	1	1		CB
182	Yellow-billed Spoonbill	<i>Platalea flavipes</i>	OV	-			1992	2	2	2		CB
232	Black-shouldered Kite	<i>Elanus axillaris</i>	OV	-			1992	2	2	2		CB
228	Whistling Kite	<i>Haliastur sphenurus</i>	T	NT			1993	1	1	1	Yes	CB
218	Spotted Harrier	<i>Circus assimilis</i>	T	V	NT		1983	1	1	1		FS
219	Swamp Harrier	<i>Circus approximans</i>	T	NT			1985	1	1	1	Yes	CB
221	Brown Goshawk	<i>Accipiter fasciatus</i>	V	-			2004	16	27	10	Yes	GL
220	Grey Goshawk	<i>Accipiter novaehollandiae</i>	OV	E	VU		1996	2	2	1	Yes	FS
222	Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>	OV	R			2005	6	12	4	Yes	PL
224	Wedge-tailed Eagle	<i>Aquila audax</i>	OV	-			2005	2	2	2	Yes	FS
225	Little Eagle	<i>Hieraaetus morphnoides</i>	OV	S			2002	4	5	3	Yes	FS
235	Australian Hobby	<i>Falco longipennis</i>	V	S			2004	13	26	12	Yes	PL
238	Black Falcon	<i>Falco subniger</i>	OV	V	VU		1987	2	3	3	Yes	
237	Peregrine Falcon	<i>Falco peregrinus</i>	OV	NT			2004	8	8	6	Yes	FS
240	Nankeen Kestrel	<i>Falco cenchroides</i>	OV	-			2004	7	8	6	Yes	CB
46	Buff-banded Rail	<i>Gallirallus philippensis</i>	OV	NT			1991	1	1	1		CB
58	Purple Swampphen	<i>Porphyrio porphyrio</i>	S	-			2005	11	22	7	Yes	GL
56	Dusky Moorhen	<i>Gallinula tenebrosa</i>	A	-			2005	20	118	18	Yes	GL
59	Eurasian Coot	<i>Fulica atra</i>	S	-			2005	8	15	7		GL
14	Painted Button-quail	<i>Turnix varia</i>	OV	S			2002	3	3	1	Yes	FS
144	Black-fronted Dotterel	<i>Elsyornis melanops</i>	OV	-			1992	2	2	2		CB
133	Masked Lapwing	<i>Vanellus miles</i>	S	-			2005	8	24	11	Yes	GL
126	Pacific Gull	<i>Larus pacificus</i>	OV		NT		1999	1	1	1	Yes	
125	Silver Gull	<i>Larus novaehollandiae</i>	A	-			2005	15	75	16	Yes	GL
957	*Rock Dove	<i>Columba livia</i>	I	-			2005	13	63	12	Yes	GL
989	*Spotted Turtle-Dove	<i>Streptopelia chinensis</i>	Pest	Pest			2005	29	252	36	Yes	GL
34	Common Bronzewing	<i>Phaps chalcoptera</i>	OV	-			2005	6	30	6	Yes	GL
35	Brush Bronzewing	<i>Phaps elegans</i>	OV	S			1985	1	1	1	Yes	CB
43	Crested Pigeon	<i>Ocyphaps lophotes</i>	V	V			2005	6	14	10	Yes	GL
30	Peaceful Dove	<i>Geopelia striata</i>	OV	E			1990	1	1	1	Yes	
23	Superb Fruit-Dove	<i>Ptilinopus superbus</i>	X				1984	1	1	1		
267	Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>	V	-			2005	13	20	10	Yes	GL
268	Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	OV	-			2004	10	15	10	Yes	DL
273	Galah	<i>Cacatua roseicapilla</i>	S	-			2005	19	54	18	Yes	GL
272	Long-billed Corella	<i>Cacatua tenuirostris</i>	S	S			2005	4	9	5	Yes	GL
271	Little Corella	<i>Cacatua sanguinea</i>	OV	R			2002	1	1	1	Yes	PL
269	Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	S	-			2005	25	63	19	Yes	GL
274	Cockatiel	<i>Nymphicus hollandicus</i>	OV	E			2004	4	4	4	Yes	PL
254	Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	A	S			2005	34	242	35	Yes	GL
256	Scaly-breasted Lorikeet	<i>Trichoglossus chlorolepidotus</i>	OV	-			2000	5	6	2		
258	Musk Lorikeet	<i>Glossopsitta concinna</i>	V	-			2005	12	51	16	Yes	GL
260	Little Lorikeet	<i>Glossopsitta pusilla</i>	V	S			2005	9	15	6	Yes	GL
259	Purple-crowned Lorikeet	<i>Glossopsitta porphyrocephala</i>	OV	S			2004	1	2	2	Yes	CB
282	Crimson Rosella	<i>Platycercus elegans</i>	E	-			2005	6	17	9	Yes	GL
288	Eastern Rosella	<i>Platycercus eximius</i>	V	-			2005	25	158	27	Yes	GL
309	Swift Parrot	<i>Lathamus discolor</i>	OV	NT	EN	EN	1989	3	3	2	Yes	CB
295	Red-rumped Parrot	<i>Psephotus haematonotus</i>	S	-			2005	21	168	18	Yes	GL
337	Pallid Cuckoo	<i>Cuculus pallidus</i>	OV	-			2001	3	3	2	Yes	FS
338	Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	OV	-			2002	5	14	3	Yes	PL
342	Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalus</i>	OV	-			2004	3	3	3	Yes	
344	Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>	OV	-			1988	1	1	1		
347	Common Koel	<i>Eudynamis scolopacea</i>	OV				2000	2	3	1	Yes	
248	Powerful Owl	<i>Ninox strenua</i>	OV	NT	VU		1993	1	1	1	Yes	CB
246	Barking Owl	<i>Ninox connivens</i>	OV	V	EN		1989	2	2	1	Yes	CB
242	Southern Boobook	<i>Ninox novaeseelandiae</i>	OV	-			2004	3	8	2	Yes	CB

Code	Common Name	Scientific Name	Conservation Status				Last Record	# Observers	# Records	# Sites	In YBP?	Certified
			Boroondara	Melb	Vic	EPBC						
249	Barn Owl	<i>Tyto alba</i>	OV	S			1970s	1	1	1		
313	Tawny Frogmouth	<i>Podargus strigoides</i>	V	-			2005	12	35	9	Yes	GL
334	White-throated Needletail	<i>Hirundapus caudacutus</i>	OV	-			1999	5	5	3	Yes	FS
335	Fork-tailed Swift	<i>Apus pacificus</i>	OV	R			1986	2	3	3	Yes	FS
319	Azure Kingfisher	<i>Alcedo azurea</i>	OV	V	NT		2006	11	13	6	Yes	GL
322	Laughing Kookaburra	<i>Dacelo novaeguineae</i>	V	-			2005	21	72	20	Yes	GL
326	Sacred Kingfisher	<i>Todiramphus sanctus</i>	E	-			2005	11	34	8	Yes	GL
318	Dollarbird	<i>Eurystomus orientalis</i>	OV	-			1988	1	1	1		CB
529	Superb Fairy-wren	<i>Malurus cyaneus</i>	V	-			2005	17	41	12	Yes	GL
565	Spotted Pardalote	<i>Pardalotus punctatus</i>	E	-			2005	16	76	26	Yes	GL
976	Striated Pardalote	<i>Pardalotus striatus</i>	OV	-			2005	4	6	5	Yes	GL
488	White-browed Scrubwren	<i>Sericornis frontalis</i>	V	-			2005	18	102	18	Yes	GL
454	Brown Gerygone	<i>Gerygone mouki</i>	T				2000	1	1	1	Yes	FS
475	Brown Thornbill	<i>Acanthiza pusilla</i>	S	-			2005	13	96	24	Yes	GL
486	Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	E	-			2004	6	44	6	Yes	GL
471	Yellow Thornbill	<i>Acanthiza nana</i>	OV	-			2005	1	1	1		CB
470	Striated Thornbill	<i>Acanthiza lineata</i>	OV	-			2001	4	4	4		
638	Red Wattlebird	<i>Anthochaera carunculata</i>	A	-			2005	31	324	30	Yes	GL
637	Brush Wattlebird	<i>Anthochaera chrysoptera</i>	S	-			2005	17	114	26	Yes	GL
640	Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>	OV	S			1982	2	2	1		
645	Noisy Friarbird	<i>Philemon corniculatus</i>	OV	E			2000	1	1	1	Yes	
646	Little Friarbird	<i>Philemon citreogularis</i>	OV	E			1989	1	1	1		
603	Regent Honeyeater	<i>Xanthomyza phrygia</i>	OV	E	CR EN		1994	7	7	3	Yes	
633	Bell Miner	<i>Manorina melanophrys</i>	A	-			2005	16	65	13	Yes	GL
634	Noisy Miner	<i>Manorina melanocephala</i>	A	-			2005	27	176	38	Yes	GL
614	Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	OV	-			2004	3	3	3	Yes	DL
617	White-eared Honeyeater	<i>Lichenostomus leucotis</i>	OV	-			2004	2	2	2		
619	Yellow-tufted Honeyeater	<i>Lichenostomus melanops</i>	T	V			2002	2	2	1	Yes	FS
622	Yellow-plumed Honeyeater	<i>Lichenostomus ornatus</i>	T	Vag/E			1983	2	2	1	Yes	FS
613	Fuscous Honeyeater	<i>Lichenostomus fuscus</i>	T	V			1983	1	1	1	Yes	FS
625	White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>	S	-			2005	27	242	29	Yes	GL
578	White-naped Honeyeater	<i>Melithreptus lunatus</i>	OV	-			2005	2	2	2	Yes	GL
631	New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>	V	-			2005	7	8	7	Yes	GL
593	Tawny-crowned Honeyeater	<i>Phylidonyris melanops</i>	T	E			1983	1	1	1	Yes	FS
591	Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	V	-			2005	10	33	12	Yes	GL
448	White-fronted Chat	<i>Epthianura albifrons</i>	X	-			1919	1	1	1		
380	Scarlet Robin	<i>Petroica multicolor</i>	OV	-			2001	3	4	3		
382	Flame Robin	<i>Petroica phoenicea</i>	OV	-			2004	5	5	5	Yes	CB
384	Rose Robin	<i>Petroica rosea</i>	T	S			2003	1	1	1	Yes	PL
383	Pink Robin	<i>Petroica rodinogaster</i>	OV	R			2004	3	3	3	Yes	
392	Eastern Yellow Robin	<i>Eopsaltria australis</i>	V	-			2005	10	16	8	Yes	GL
416	Crested Shrike-tit	<i>Falcunculus frontatus</i>	E	-			2004	8	25	7	Yes	CB
405	Olive Whistler	<i>Pachycephala olivacea</i>	T	S			1985	1	1	1	Yes	CB
398	Golden Whistler	<i>Pachycephala pectoralis</i>	V	-			2004	8	25	5	Yes	GL
401	Rufous Whistler	<i>Pachycephala rufiventris</i>	OV	-			2004	3	4	3	Yes	DL
408	Grey Shrike-thrush	<i>Colluricincla harmonica</i>	V	-			2005	13	40	14	Yes	GL
365	Leaden Flycatcher	<i>Myiagra rubecula</i>	T	NT			1982	1	1	1		
366	Satin Flycatcher	<i>Myiagra cyanoleuca</i>	T	-			2001	2	2	2	Yes	PL
369	Restless Flycatcher	<i>Myiagra inquieta</i>	T	-			1989	3	3	3		
415	Magpie-lark	<i>Grallina cyanoleuca</i>	A	-			2005	31	270	34	Yes	GL
362	Rufous Fantail	<i>Rhipidura rufifrons</i>	OV	-			2004	2	2	2	Yes	
361	Grey Fantail	<i>Rhipidura fuliginosa</i>	V	-			2005	16	63	15	Yes	GL
364	Willie Wagtail	<i>Rhipidura leucophrys</i>	S	-			2005	28	258	29	Yes	GL
424	Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	V	-			2004	19	75	13	Yes	DL
430	White-winged Triller	<i>Lalage sueurii</i>	T	NT			1993	2	5	2	Yes	CB

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			Boroodara	Melb	Vic	EPBC						
671	Olive-backed Oriole	<i>Oriolus sagittatus</i>	OV	-			2001	3	10	3	Yes	
544	Masked Woodswallow	<i>Artamus personatus</i>	T	R			1982	1	1	1	Yes	FS
545	White-browed Woodswallow	<i>Artamus superciliosus</i>	T	R			1982	1	2	2	Yes	FS
547	Dusky Woodswallow	<i>Artamus cyanopterus</i>	E	-			2005	8	24	4	Yes	GL
702	Grey Butcherbird	<i>Cracticus torquatus</i>	S	-			2005	22	117	31	Yes	GL
705	Australian Magpie	<i>Gymnorhina tibicen</i>	A	-			2005	32	280	36	Yes	GL
694	Pied Currawong	<i>Strepera graculina</i>	S	-			2005	14	68	16	Yes	GL
697	Grey Currawong	<i>Strepera versicolor</i>	OV	-			2005	2	4	4		GL
930	Australian Raven	<i>Corvus coronoides</i>	DD	-			2001	4	10	4	Yes	
954	Little Raven	<i>Corvus mellori</i>	A	-			2005	25	154	31	Yes	GL
693	White-winged Chough	<i>Corcorax melanorhamphos</i>	T	S			1999	1	1	1		
993	*Skylark	<i>Alauda arvensis</i>	Pest	Pest			1991	1	1	1		CB
647	Richard's Pipit	<i>Anthus novaeseelandiae</i>	T	-			1998	1	1	1		
995	*House Sparrow	<i>Passer domesticus</i>	Pest	Pest			2004	17	94	16	Yes	DL
994	*Eurasian Tree Sparrow	<i>Passer montanus</i>	I	Pest			1999	3	5	4	Yes	
662	Red-browed Finch	<i>Neochmia temporalis</i>	E	-			2004	10	15	5	Yes	DL
997	*European Greenfinch	<i>Carduelis chloris</i>	I	-			2004	3	7	5	Yes	DL
996	*European Goldfinch	<i>Carduelis carduelis</i>	Pest	Pest			1989	4	10	6	Yes	
564	Mistletoebird	<i>Dicaeum hirundinaceum</i>	V	-			2004	11	19	6	Yes	DL
357	Welcome Swallow	<i>Hirundo neoxena</i>	S	-			2005	25	195	26	Yes	GL
359	Tree Martin	<i>Hirundo nigricans</i>	OV	-			1999	3	4	2	Yes	
360	Fairy Martin	<i>Hirundo ariel</i>	OV	-			1988	1	1	1		
524	Australian Reed-warbler	<i>Acrocephalus stentoreus</i>	OV	-			2004	2	2	2		DL
522	Little Grassbird	<i>Megalurus gramineus</i>	E	-			1988	1	1	1		
509	Rufous Songlark	<i>Cincloramphus mathewsi</i>	OV	NT			1999	1	2	2	Yes	FS
525	Golden-headed Cisticola	<i>Cisticola exilis</i>	T	-			1989	1	1	1		
574	Silvereye	<i>Zosterops lateralis</i>	S	-			2005	14	59	16	Yes	GL
779	Bassian Thrush	<i>Zoothera lunulata</i>	OV	NT			1997	2	2	2	Yes	CB
991	*Common Blackbird	<i>Turdus merula</i>	Pest	Pest			2005	29	294	37	Yes	GL
992	*Song Thrush	<i>Turdus philomelos</i>	Pest	-			2004	8	14	6	Yes	
999	*Common Starling	<i>Sturnus vulgaris</i>	Pest	Pest			2005	26	177	34	Yes	GL
998	*Common Myna	<i>Acridotheres tristis</i>	Pest	Pest			2005	31	306	36	Yes	GL

Glossary and Abbreviations

Alluvial	An adjective referring to soil deposited by a stream or floodwater.
Biodiversity	The range of flora, fauna, ecological communities and genetic material.
Biogeography	The study of the geographical distributions of different types of flora and fauna, and the geographical factors which influence those distributions.
Conservation Significance	This term has special meaning under Victoria's Native Vegetation Framework (NRE 2002a), in which it is defined by Table 5 (p.53) on the basis of such matters as the conservation status of the EVC present, the Habitat Score and the presence of listed wetlands, National Estate values or rare or threatened species.
Conservation Status	The level of risk of extinction faced by a species, community or other type of indigenous biological asset. This can be determined at various spatial scales; for example, a species may have a conservation status of 'vulnerable' at the global scale and 'critically endangered' within Boroondara. See Section 2.4 for more detail.
DSE	Department of Sustainability & Environment
EVC	'Ecological Vegetation Class', a type of vegetation or wetland recognised in a state-wide system of classification developed by the Department of Sustainability and Environment. An EVC may include multiple vegetation 'communities' or 'associations' with different mixtures of species, but similar ecological and topographic conditions.
Habitat Score	A measure of vegetation condition or quality within any area that is fairly uniform in its ecological characteristics, taking into account tree density, diversity of plant sizes and forms, weediness, degree of natural regeneration of flora, organic litter cover and presence of logs. It is a number in the range 0-1. The procedure for determining it is described by Parkes <i>et al.</i> (2003).
IGAE	The Intergovernmental Agreement on the Environment between the federal, state and territory governments of Australia.
Invertebrate	Fauna without backbones, such as insects, spiders, crustaceans and molluscs.
Perennial	Adjective. A perennial stream or water body is one that does not normally dry out.
Precautionary Principle	The principle that (as written in the National Strategy for the Conservation of Australia's Biological Diversity) ' <i>Lack of full knowledge should not be an excuse for postponing action to conserve biological diversity, or as defined more generally in the Intergovernmental Agreement on the Environment: 'Where there are threats of serious or reversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by: (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and (ii) an assessment of the risk-weighted consequences of various options.'</i> This also appears (with slight re-wording) in Section 1C of the Victorian <i>Environment Protection Act 1970</i> .
Riparian	An adjective meaning 'occurring beside a stream'. A riparian zone occurs along a stream and is directly influenced by the flowing water.
Taxon (plural <i>taxa</i>)	A group of organisms that are classified together, which may be at the level of a species, subspecies or any other level. For example, the eucalypt subspecies, <i>Eucalyptus leucoxylon</i> subspecies <i>connata</i> and the hybrid <i>Eucalyptus</i> × <i>studleyensis</i> are both taxa (but not species).
Taxonomy	The theories and techniques of naming, describing, and classifying organisms.

Type Locality The location from which a specimen was taken to scientifically describe a new taxon. This 'type specimen' is permanently preserved and serves as the archetype for that taxon. The definitive way of determining whether another specimen belongs to the same taxon is by comparison with the type specimen.

Vertebrate Fauna with backbones, including mammals, birds, amphibians, reptiles and fish.